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Japan Report

(FOUO 18/82)

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SCIENCE AND TECHNOLOGY

ECONOMIC

GLOBAL APPROACH TO TRADE FRICTION URGED

OW270955 Tokyo ASAHI EVENING NEWS in English 26 Feb 82 p 5

[ASAHI SHIMBUN 25 February editorial: "International Economic Diplomacy"]

[Text] There are increasing signs of friction in the economic relations between Japan and the nations of Europe and the United States. U.S. President Reagan, while praising Japan's cooperative attitude toward the United States, did not fail to strike home the message to a visiting delegation of Liberal-Democratic party Dietmen that he hopes that U.S. goods can enter the Japanese market in the same way that Japanese goods have become widespread on the U.S. market.

The U.S. Congress is considering various reciprocity measures to equalize market openness between the United States and other countries. The European Community, on the other hand, is investigating a plan for bringing the subject of the closed nature of the Japanese market up for discussion by GATT (General Agreement on Tariffs and Trade).

Since the new Suzuki cabinet was announced about three months ago, two measures have been taken toward resolving such friction with foreign countries: first, the timetable for enacting the Tokyo round of tariff reductions has been advanced; second, non-tariff barriers, such as import inspection procedures, have been changed. Critics in the United States and Europe agree that while these steps represent a step in the right direction, they are still not enough.

Japan intends to participate at the summit conference of advanced nations scheduled for June and must again examine how to make progress in its economic diplomacy. Regardless of what the EC decides to do, Japan itself should make it clear that it is following the rules of international trade set forth by GATT.

Trade issues should not be settled politically in such a way as to disregard the existence of GATT, as happened at the time of last year's agreement to exercise self-restraint on automobile exports to the United States. At the same time, it is useless to try to avoid a re-examination of certain issues related to the principles of GATT, such as those on residual import restrictions.

Of the 27 items presently restricted by Japan, 22 are agricultural, fish or forest products. In regard to agriculture, there are many cases where advanced nations have taken protectionist measures. Even the United States, which is the world's largest exporter of agricultural products, maintains an existing import restriction on one product and restrictions authorized by GATT on 13 products. The EC nations maintain a generous system for protecting their own agricultural sectors by adding import surcharges to offset the price advantages of imports which are cheaper than the EC products and by providing export subsidies when the prices of EC exports are above international levels.

Considering the poor geographical conditions of Japan, appropriate protectionist policies are unavoidable. However, efforts must be continued to permit liberalization and lower agricultural prices regardless of whether there is foreign pressure to do so or not, so that consumers can buy meat and other products less expensively.

A special feature of the reciprocity measures before the U.S. Congress is that they aim not only at transactions in goods, but also at the issue of the exchange of services. This issue should be seen, first of all, in relations to the irritation that the United States and European nations feel over the difficulty of penetrating the Japanese market. The Ministry of Finance, for example, recently announced that it did not discriminate between domestic and foreign enterprises in its administration of banks, insurance companies and security companies. Clearly, foreign complaints are off the mark in several places.

Behind this issue, however, there is another important concern, how to handle foreign dissatisfaction when it results from the fact that Japanese customs differ from their own. Taking orders for special treatment is going too far, and such orders should be resisted. Nonetheless, we should reconsider from an international perspective whether Japan itself retains a tradition of excess administrative intervention in business.

In any case, neither GATT nor the Organization for Economic Cooperation and Development (OECD) have established international rules for regulating the various service industries. Japan should participate aggressively in the discussions on this issue which are being called for by the United States.

CSO: 4120/179

ECONOMIC

'MAINICHI DAILY NEWS' URGES MORE LIBERAL TRADE MARKET

OW011253 Tokyo MAINICHI DAILY NEWS in English 27 Feb 82 p 2

[Editorial: "Japan and Trade Friction"]

[Text] We do not deny the principle of free trade; however, on the pretext of following this principle, the United States Government and Congress are exhorting national interests. According to Masumi Esaki, chief of the Liberal-Democratic Party delegation to the U.S., the American attitude can be compared to a ball game where "American players and umpires get together and make decisions as they please."

This attitude is amply reflected in draft bills shortly to be sent to Congress aimed at restricting Japanese exports to the U.S. to the sacle of U.S. exports to Japan. We believe that world trust in the American leadership will diminish if Congress passes the bill.

The American measures are based on the irrigation they feel toward the "closed" Japanese market. In his meeting with Esaki, President Ronald Reagan, while appreciating Japan's efforts to improve the nontariff barrier issues, said that American goods are not penetrating the Japanese market.

We partially agree with Reagan. Japan has improved its nontariff barrier system but still maintains complicated import procedures. The Japanese distribution system is so complicated that even domestic dealers cannot join existing distribution routes, while the overprotection of small- and medium-sized retailers has proved an obstacle to improving their productivity.

In the agricultural field, we do not see any noticeable improvement in its structure, although the beef and orange import quotas were set temporarily in anticipation of future liberalization. Agricultural organizations in Japan claim that an acceptance of American liberalization requests means shifting pressure to Japanese agriculture from other industries which enjoy profitable exports.

At present, we see tension between American nationalism, trying to protect its manufacturing industry while putting up free trade signs and at the same

time indicating possible retaliatory measures, and Japanese nationalism, which does not want to accept further liberalization of the agricultural and distribution sectors. The clash between the two must be avoided at all costs because it will only result in intensified protectionism.

In this respect, we would like to point out the lack of self-consciousness of the Japanese people about the status of Japan, which has become a leading economic power with 10 percent of world gross national product [GNP]. We call Japan an economic power but we must remember that free trade is the only way to enrich Japanese life.

We believe that Japan must open its doors to the agricultural and distribution sectors. In this way, these sectors can improve their productivity. We know that changing these systems will not be enough to fully implement liberalization; however, some sectors obstinately adhere to their characteristic traditions and customs. In other words, Japan's group-centered way of thinking is different from American individualism. American criticism of such a social structure is arbitrary.

The psychology of the Japanese refuses to accept "foreigners," regardless of whether they come from different Japanese groups or foreign countries. Japan must correct this isolationistic character.

To avoid criticism that Japan is unfair, it must drastically increase its official development Assistance (ODA), whose ratio to the gross national product is relatively low among the industrially developed nations. This must be raised to the ratio of the military expenditures of major European nations to their GNP.

Japan must adopt reasonable policies so that there remains no room for criticism from the United States and Europe. Moreover, we call on the government of Prime Minister Zenko Suzuki to inform the U.S. Government that President Reagan's economic policy with emphasis on military expansion has accelerated the recession and unemployment in the United States and caused the huge Japanese trade surplus. Reagan's economic policy is preventing the American economy from restoring its competitiveness in the international market. We urge the Japanese Government to point this out to the U.S. Government.

CSO: 4120/179

ECONOMIC

TRADE DISPUTE, STRAINED U.S. TIES DISCUSSED

OW030601 Tokyo NIHON KEIZAI SHIMBUN in Japanese 2 Mar 82 Morning Edition p 2

[Editorial: "Strained Japan-U.S. Relations and Japan's New Response"]

[Text] The U.S. Congress has opened a series of hearings on Japan. In this country, the ministerial conference on economic countermeasures is scheduled to meet today, 2 March, to hear reports from Masumi Esaki and his LDP trade mission which returned from Washington late last week, and to begin a study of new measures to ease economic friction with the United States. Japan-U.S. relations are thus entering a crucial phase in a strained atmosphere that threatens to culminate in Foreign Minister Sakurauchi's visit to Washington in late March.

Judging from complaints heaped on the LDP mission by U.S. officials and legislators during its visit, the atmosphere of those congressional hearings will most likely increase its harshness. There is a strong possibility that U.S. demands on Japan will further escalate on the strength of the reciprocity bills now before the congress. It is perhaps true, too, that Japan is being turned into a scapegoat in connection with the deepening recession and the off-year elections scheduled for this fall in the United States. However, it can be said with certainty that, as U.S. demands continue to grow, Japan is left with less and less room for effective response. One cannot deny that the increasing gap thus created is contributing to Japan's difficult plight and to the intensity of friction.

However, in view of Japan's position that she must attach importance to her relations with the United States and defend free trade, she is required to go through the list of potential measures, no matter how limited, pick any effective ones and put them to work. She is also required to move into areas that were not touched in the past and seek out whatever can be done there.

Secretary of Commerce Baldrige urged Japan to do "something dramatic to open her market" without explaining what he means specifically by that. The ambiguity surrounding his comment is one of the factors adding to the difficulty of the Japanese plight. Judging from the substance of the Baldrige remarks, however, there is no doubt that the U.S. demand is mainly for the

elimination of residual restrictions on the imports of beef, citrus fruit and other farm products, expanded tobacco imports, and the opening of the banking, insurance and other service markets.

U.S. complaints are not confined to these items. They are complex and cover a broad range, including those about Japan's meager imports of manufactured goods, the structure of her foreign trade, with excessive emphasis on raw material imports, complicated exchange systems, and the nation's unique economic quality based on customs and traditions.

If the disputes should encompass these problems, too, it would be difficult to reach a settlement, because they are not the type of problems which can be resolved overnight. The United States should also understand that it is not in her interests to generate unnecessary antagonism among the Japanese people and aggravate the situation with too hasty and too high-handed demands.

For this reason, it is more important now than before that the two sides discuss problems with patience and without allowing themselves to become too eager for a settlement. Especially, it is important for Japan now to review pending Japan-U.S. issues once more from an unbiased viewpoint, clearly define what can be done and what cannot be done; what can be done on long- and medium-range bases and what can be done on a short-range basis; and to express her resolve to open the market, beginning with short-range items.

Farm products are one of the key items. Aside from the strong domestic resistance to their liberalization, it is doubtful if liberalization, as in the case of beef, will actually benefit the United States; there are other countries which are as competitive. Nevertheless, it is necessary for Japan to take another look at the possible scope of liberalization. It is true that under the present circumstances, Japan cannot afford to leave farm products off the liberalization list in demonstrating her resolve to open the market.

More "pains" will accompany the nation's trade liberalization efforts from now on. We should be prepared to undergo them during certain phases of the process. Free trade is the way for Japan to follow. At the same time, it should be remembered that liberalization under foreign pressures will not necessarily keep Japan on the losing side all the time, as we see it, in the liberalization of trade and the capital market.

CSO: 4120/179

ECONOMIC

TRADE FRICTION, ESAKI MISSION TO U.S. VIEWED

OW051237 Tokyo ASAHI EVENING NEWS in English 4 Mar 82 p 5

[ASAHI SHIMBUN 3 March editorial: "Trade Friction"]

[Text] How should we cope with the growing trade friction between Japan and the United States and Europe? With the return to Japan of the Liberal-Democratic Party mission to the U.S., which was headed by Masumi Esaki, the government has begun studying some comprehensive measures. A series of hearings on U.S.-Japan relations have started in the U.S. Congress, and American pressure on Japan, in connection with both trade and defense, is expected to become stronger.

We should not allow ourselves to be bemused by the vociferousness of our American and European critics; instead, we should listen dispassionately to their arguments. The Council of Economic Cabinet Ministers, in its meeting on March 2, was right to agree that it was important properly to comprehend American demands before deciding on the measures that should be taken.

Of course, the greatest problem is how Japan should respond to the American and European demands.

The government will naturally have to take a variety of measures. But if the other parties to the dispute take account only of their own interests, the government should be prepared to say bluntly that they should not measure everything by their own yardsticks. On the other hand, in cases where the responsibility for trade friction clearly rests with Japan, the government must seriously consider immediate steps.

At the same time, a basic long-term strategy is needed. Cosmetic measures like those hitherto taken will not be acceptable in the future. The situation is much more difficult.

From this point of view, the results of the Esaki mission to the U.S. must be considered inadequate.

The Americans openly criticized Japan, and said that unless Japan quickly took some fundamental steps, there was the danger of reciprocity resolutions being

passed by congress. It is very doubtful that the Americans changed their thinking as a result of the rebuttals made by the Esaki mission.

While the mission was in the U.S., chief cabinet secretary Kiichi Miyazawa counterattacked by saying that Japan had moved up the lowering of tariffs and removed non-tariff barriers. He even spoke in terms as strong as those used by high American officials, as when he said, "Our feeling is, 'try taking the same steps if you think you can.'" But Prime Minister Suzuki, who received a report from Esaki after the mission's return, said, "I can definitely understand the American position."

This raises the question whether Esaki's main duty was to listen to the American arguments.

It has been said that when the LDP established its special committee on international economic measures, Esaki was made chairman and given the duty of visiting the U.S. principally because of his status as a high official in the Tanaka faction. It has also been said that his visit was designed to lay the groundwork for Foreign Minister Sakurauchi's coming visit to the U.S. or to ensure that Sakurauchi was not held solely responsible for bilateral problems on his visit.

It is a matter for great regret if such speculation at the party level had an influence on an important issue of foreign policy. But even greater doubts should be voiced in connection with the fact that Esaki was sent to the U.S. at a time when the government had no clear policies or measures.

The government must make studies of the import of individual items, such as beef and oranges, the liberalization of which the U.S. is demanding. Nevertheless, it must be recognized that the roots of the trade friction are so deep that they cannot be resolved through measures that concern only individual items.

Surely, some long-term measures are needed to bridge the various differences between Japanese social conditions on the one hand and American and European social conditions on the other. We should again study steps to improve the standard of living of the people; these would include increasing wages, introducing a five-day workweek and long paid vacations, and constructing housing, waterworks, sewerage systems and public parks.

CSO: 4120/179

ECONOMIC

UN REPORT ON JAPAN'S TARIFFS CRITICIZED

OW040413 Tokyo NIHON KEIZAI SHIMBUN in Japanese 3 Mar 82 Morning Edition p 2

[Editorial: "Is Japan a High-Tariff Nation?"]

[Text] A UN organization has now joined with the United States and the EC nations in criticizing Japan for the exclusivity of her market. The organization in question is UNCTAD, which has made its criticism in a report to be submitted to a meeting of its trade and development board, opening in Geneva on 8 March. Stern voices demanding that Japan open its market wider are increasing in the United States and the European industrialized nations, with reciprocity bills introduced in the U.S. Congress, and the EC Council in a move to appeal to GATT against Japan.

According to KYODO Press Agency, this report, entitled "Protectionism in the World Economy and Structural Readjustment," warns that, as a result of mounting world protectionism, trade has become more and more discriminatory and exclusive and points to the need for each nation to readjust its economic and trade structures so that the international market can function more effectively.

What attracts our interest most, and arouses our misgivings in the reported summary of the UNCTAD report, are figures giving the impression that Japan is a high-tariff nation and is still trying to keep foreign goods from its domestic markets through high tariffs. The report asserts that Japan charges import tariff rates of 7 percent on a weighted average against the European Common Market's 2.9 percent and the United States' 4.3 percent.

These figures differ so widely from what the Japanese Government used to tell its people: That is, in brief, that, particularly as a result of the Tokyo round of multilateral trade negotiations, Japan's tariff level is among the lowest of all major industrialized nations. We fear that the UNCTAD report will spur complaints against, and trade frictions with, Japan.

It has already uncovered the difference between UNCTAD and the Japanese Government over tariff figures being attributable to the difference in computation bases. To be specific, the EC, for instance, included, in the computation of its tariff level, those preferential tariffs charged on developing nations under the Lome convention. Needless to say, giving goods from developing nations easy access to developed countries constitutes an important pillar

in North-South cooperation. That is why GATT introduced a general preferential tariff system, to which Japan also subscribes. Nevertheless, the regional preferential system is, by nature, discriminatory. Therefore, it is regrettable that the UNCTAD report, which censures discriminatory trade, should criticize Japan's tariff level on the basis of figures which include preferential tariff rates.

The UNCTAD report is said to be harshly critical of the mounting protectionist tendencies in the United States and EC countries. So it seems it does not necessarily echo the chorus of criticism against Japan by the United States and the European countries. Therefore, it must contain many suggestions which deserve our close attention. In this connection, we want to emphasize that what is needed in curbing protectionism is, instead of finding a scapegoat and engaging in a verbal war, that we should, as the UNCTAD report points out, promote active international cooperation in achieving a readjustment of our economic and trade structures.

CSO: 4120/179

ECONOMIC

INDEPENDENT SANCTIONS AGAINST USSR QUESTIONED

OW260633 Tokyo NIHON KEIZAI SHIMBUN in Japanese 25 Feb 82 Morning Edition p 2

[Editorial: "Sanctions Against the USSR and Unstable East-West Relations"]

[Excerpts] One wonders what place future historians will assign to the current sanctions against the Soviet Union in the big tide of East-West relations. U.S.-initiated sanctions against Poland and the Soviet Union began by criticizing the imposition of martial law in Poland and the behind-the-scenes Soviet intervention. But the disarray among Western countries over sanctions has given rise to the argument that it is threatening the very existence of the Atlantic Alliance. As a matter of fact, concrete measures taken by each country seem to serve as a test of loyalty to the Alliance. Japan has announced somewhat weak-kneed sanctions of her own, which are different from those adopted by other Western countries. But we are afraid that Japan seems to lack a convincing reason why she has gotten out of step with other Western countries and taken these independent measures.

It is worth special mention that the U.S. sanctions against the Soviet Union did not come into being overnight, but are closely linked with the undercurrent of America's economic strategy vis-a-vis the Soviet Union, which began to take shape slowly in the mid-1970s. True, the Reagan administrations Soviet strategy appears rather overbearing and seems to lack muscle. But when it comes to economic sanctions, the U.S. administration is apparently set to tackle the matter on a long-term basis from a security point of view, with the Department of Defense playing the central role.

In formulating and executing foreign economic policies, the Reagan administration follows the same pattern as the preceding administrations, namely unfolding them through coordination between the Defense, State and Commerce Departments. But the position of the Defense Department, which advocates the "criticial technology" concept from a security point of view, has gained in strength over that of the State Department, which is in charge of negotiations on matters pertaining to the Coordinating Committee for Export Control [COCOM]. Conspicuously, under the Reagan administration, those officials in favor of restrictions against the Soviet Union are said to have gained more ground than they did under the Carter administration. The concept of "critical technology"

aims at controlling transfer of know-how useable in military high technology and equipment. European countries are strongly critical of this concept, because the scope of its application is rather obscure. Nevertheless, the concept is reflected in the 1979 Export Control Act, according to some observers. At any rate, all evidence strongly indicates at least that the Reagan administration has adopted sanctions against the Soviet Union apart from COCOM restrictions.

The COCOM embargo list for controlling the West's exports to the communist bloc is a kind of gentlemen's agreement and has no binding force. It lacks adaptability and propaganda effects due to its principle of no publicity and its failure to keep pace with rapid technological development. Certainly, COCOM operations face a great turning point. That is why the United States may be feeling all the more keenly the need for a dynamic economic strategy toward the Soviet Union on the basis of domestic laws. But, generally speaking, European countries are skeptical of the idea of anti-Soviet sanctions themselves.

On the other hand, some people in the United States conspicuously talk of a "crisis of the Atlantic Alliance," irritated by the weak stance of European countries towards economic sanctions against the Soviet Union. Occasionally, others argue, in relation to the issues of how to readjust America's European policy and how to settle the Polish issue, that the Yalta arrangement, which has reigned over postwar Europe, should be reviewed. It is an undeniable fact that the antinuclear movement and the neutralist tendency, which surged through Europe last year, are partly responsible for the advocacy, in the United States, of a review of its policy toward Europe.

A review of the Yalta arrangement, needless to say, is easier said than done. Take the question of reunification of Germany for instance; the difficulty of revising the agreement will become clear at once. Behind the argument in favor of revamping the Yalta Agreement, one may see a U.S. threat to reduce its military deployment in Western Europe.

The question of sanctions against the Soviet Union seems to have highlighted difficulties involving, not only East-West relations, but also relations among Western nations. That is why Western leaders may be insisting that Western nations should consult with each other all the more closely. What kind of long-term economic strategy the West should formulate toward the Soviet Union is one of few themes on which Western Europe and Japan can consult on an equal footing.

We cannot but admit that in this regard, Japan's position is weak compared with the United States, which can use the Helsinki Accords as a basis for sanctions, and Western Europe which can cite EC and NATO as the ground for sanctions. Therefore, it is urgent for Japan to enhance her role in the COCOM functions and take other necessary steps to consolidate her position so that she can at least avoid losing ground to Soviet counterarguments.

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ECONOMIC

'MAINICHI DAILY NEWS' VIEWS SANCTIONS AGAINST USSR, POLAND

OW280719 Tokyo MAINICHI DAILY NEWS in English 26 Feb 82 p 2

[Editorial: "Sanctions and After"]

[Text] The government has announced sanctions against the Soviet Union and Poland, claiming that the situation in Poland has not been improved.

The Polish military regime has been suppressing human rights and the Soviet Union has been indirectly intervening in the internal affairs of Poland. With this belief in mind, Prime Minister Zenko Suzuki issued warnings to Moscow. The government has taken the latest step because the Soviet Union and Poland had turned deaf ears to such warnings.

We do not deny that the present situation in Poland, which has been under military control for the past 2.5 months, is liable to develop into a world crisis. The United States and other Western nations have imposed sanctions on the Soviet Union and Poland in some form or another and under such circumstances, Japan's action can be interpreted as an option which demands that the two communist nations in question give serious thought to what has taken place in Poland.

Japan's punitive measures are not necessarily strict. Sanctions against the Soviet Union comprise: 1) Japan will not agree to the opening of the Commission on Science and Technology Cooperation; 2) Japan will not accept a call for the holding of the annual Soviet-Japanese trade talks; 3) Japan will not study the possible expansion of the Soviet Office of Trade Representative in Japan; and 4) Japan will carefully study the possible extension of the stay in Japan for the Soviet purchasing mission members, whose visas are to expire in December this year.

Against Poland, two measures were added to the travel restriction imposed on Polish diplomats in Tokyo on February 18. The two measures are: 1) Japan will not agree to hold talks on the rescheduling of the $100 million debt payment due this year; and 2) Japan will not study the extension of new credit to Poland.

It may be true that we cannot expect effective results from such moderate measures. We must remember that a wide difference of views exists between the United States and Western nations on practical measures for sanctions.

The difference of views between the United States and Western European nations is seen most clearly in their policy to cooperate with the Soviet natural gas development plan. On December 29, President Ronald Reagan announced seven-point sanctions against the Soviet Union which said, among others, "Licenses will be required for export to the Soviet Union for an expanded list of oil and gas equipment. Issuance of such licenses will be suspended. This includes pipelayers."

On this specific point, the U.S. State Department, in its background briefing, said the same day: "The energy area, particularly oil production, is one of the sectors most dependent on outside equipment and technology. This is a field where U.S. exports are particularly valuable to the Soviets."

Some Western European nations reacted strongly against the U.S. policy because these nations, especially West Germany and France, are expecting to purchase Siberian natural gas in the future. Some U.S. officials, including those in the Defense Department, believe that Western European dependence on Soviet energy is dangerous but as long as the United States is unable to guarantee the supply of energy to these nations, the United States has no practical measures to prevent them from promoting their programs.

The difference of views is based on the basic policy of the United States and Western Europe--the former adhering to the way of thinking that regards the East-West relations in the cold war concept and the latter having closer economic relations with the Eastern bloc which developed rapidly during the detente in the 1970s.

To effectively implement the sanctions, we believe that the Western nations must resort to a reverse measure--closer relations with the Soviet Union and Eastern European nations which, in turn, will increase dependence on the West.

Japan and the Soviet Union will exchange new ambassadors shortly. The latest sanctions should not become obstacles for continued dialogue with the Soviet Union.

CSO: 4120/178

ECONOMIC

CIGARETTE SALES LIBERALIZATION URGED

OW051225 Tokyo NIHON KEIZAI SHIMBUN in Japanese 4 Mar 82 Morning Edition p 2

[Editorial: "Liberalize Cigarette Sales and Compete Face to Face!"]

[Text] The issue of liberalizing cigarette sales has been rekindled as part of the controversy over trade friction between Japan and the United States. The United States is demanding that Japan open its market to U.S.-made cigarettes on the ground that market share for U.S. cigarettes in Japan is only 1 percent due to Japan's monopoly system, another trade barrier.

The U.S.-made cigarette sale expansion measure which was agreed upon in the fall of 1980 and put into effect in April last year provides that the Japanese tariff rate will be lowered to 35 percent at one swoop from 90 percent which was equivalent to the EC rate. The measure also provides that the number of stores selling U.S. cigarettes will be increased by 40 percent and that U.S. cigarette manufacturers can spend up to 1 billion yen in advertisement and sales campaign outlays. When the measure was adopted, the Japanese Finance Ministry and the Japan Tobacco and Salt Corporation must have felt that they had taken a bold measure.

Yet in less than a year after the implementation of the measure, the United States has come out with another demand by taking advantage of the current wave of criticism against Japan. It is fully understandable that Japan feels a sense of distrust of the U.S. attitude. While raising the prices of tobacco products exported to Japan by 30 percent, the United States is demanding that Japan keep the retail prices at their present level. This amounts to demanding that the 35 percent tariff rate be abolished. Generally speaking, the U.S. demand is too hasty and smacks of a poor policy.

Aside from its hastiness, the U.S. demand touches the heart of the matter. This is because Japan's cigarette monopoly system hampers a free market system. From the beginning, there would have been no U.S. demands with regard to the sales prices and the number of retail outlets but for the monopoly system. Nor would there have been such a strange thing as a limit on outlays for advertisement and sales campaigns. The Finance Ministry and the Cigarette and Salt Public Corporation are still urging the preservation of the monopoly system, but their basis of argument lacks persuasiveness. We will touch it very briefly here since we dealt with it at length in this paper's 30 November 1981 issue.

First, as for securing a revenue source, which is cited as the foremost basis of their argument, it will be possible to raise as much revenue as now even if the cigarette industry is turned over to private firms. Second, the counterargument that sales campaigns by U.S. cigarette firms will most probably result in an increase in cigarette consumption is quite absurd. When this argument is stretched to the extreme, it will negate the reason for existence of the cigarette manufacturing industry itself, whether it is run by a public corporation or by private enterprises, if the matter is considered from a point of view of public health. Third, the argument that private firms manufacturing cigarettes will [be] squeezed out by foreign competitors stems from a bureaucratic view of one who does not understand the qualities of private businessmen. Fourth, if the public monopoly corporation has a high productivity, it is only true with its factories. On the whole, the corporation is inferior to private firms in productivity.

Lastly, there remains a problem concerning domestic tobacco growers. It should be a duty of the government to lead them in a desirable direction while giving them an ample time to readjust. Some Dietmen's out-and-out opposition to liberalization may inevitably be viewed as stemming from a vote-getting motive just as some U.S. congressmen's unreasonable demands.

The Japanese monopoly system consists of three divisions, namely, purchase of materials, manufacturing, and sales. Of the three, the sales division is the one the United States is most concerned with. The United States produces large quantities of tobacco leaves at a cost about one-third of that in Japan. With the low cost of tobacco leaves and the latest technology, the United States is strongly convinced that the U.S. cigarettes are No 1 in the world. No wonder U.S. cigarettes have secured a between 10 and 20 percent market share, or even more in some cases, in European countries. In the U.S. opinion, it is due to the high tariff rate and the monopoly system that the market share of U.S. cigarettes in Japan is unusually low.

However, the Americans make light of the differences of taste among various nations. They also underestimate the level of Japan's cigarette manufacturing technology. Even if Japan liberalizes the cigarette market, it is doubtful whether things will turn out as the United States is figuring out. For this reason, it will be in the interest of Japan, from both short and long-term points of view, for it to eliminate the tariffs on cigarettes, liberalize their sales and compete with the U.S. cigarette industry face to face.

CSO: 4120/179

ECONOMIC

GATT ADVICE IRRITATES JAPAN

OW191049 Tokyo NIHON KEIZAI SHIMBUN in Japanese 18 Feb 82 Morning Edition p 1

[Text] It was disclosed on 17 February that Dunkel, secretary general of the General Agreement on Tariffs and Trade (GATT), had strongly urged the Japanese Government to promptly take drastic action to open the Japanese market. It is a very exceptional case for the GATT secretariat, a neutral international organization on trade issues, to make a request to a specific country that can virtually be taken as an advice. Specifically, the GATT secretary general asked that Japan further accelerate the lowering of tariffs, improve the situation in nontariff barriers and remove import restrictions on farm products and other remaining items at an early date.

Commenting on the Dunkel statement, the government said, "We will continue our efforts to open our market," but voiced strong opposition to it, saying, "It is a statement with strong political overtones, providing lateral support for the call of the United States and the EC on Japan to open its market." The government is even considering lodging a protest to Secretary General Dunkel, depending on circumstances.

Secretary General Dunkel has met separately with Japanese Government representatives, including Deputy Vice-Minister for Foreign Affairs Matsunaga and Yamada, director of the MITI international economic affairs department, who recently visited Geneva to attend a meeting of 18 GATT member countries (CG-18). At the meetings, the secretary general said: "Now that the United States, which has propped up the postwar GATT system, has been weakened economically, due to recession and other factors, Japan should take the place of the United States and perform a central role in promoting the free trade system. This would result in checking the emergence of protectionism." He then told them, "Japan should take tangible measures to open its closed market immediately."

As drastic measures, the secretary general cited the further expansion and strengthening of the lowering, ahead of schedule, of tariffs, mainly on electronic computers, which Japan decided to carry out last November, and the improvement in nontariff barriers, involving 67 items. In addition, he called for an early removal of import restrictions imposed on 27 remaining items, comprising mainly farm products.

Noting that Dunkel placed emphasis on the removal of import restrictions still in effect, a top-level MITI official has said, "What he calls tangible measures is nothing but a review of import restrictions still in effect." Since Dunkel made his remarks at official meetings, the government takes them as a virtual advice.

The government said, "There is nothing particularly new about the advice, because the question of opening the Japanese market has been discussed at Japan's talks with the United States and the EC." However, it voiced strong opposition to the virtual advice given by the secretary general, who should play the arbitrator's role in GATT, whose highest decision-making organ consists of its member countries, including Japan. The government is afraid that, if GATT, a neutral organization, makes its pro-U.S., pro-EC position clear and criticizes Japan, an impetus might be given to the moves of the United States and the EC in strongly demanding the opening of the Japanese market and the closed nature of the Japanese market might be emphasized internationally. The government takes the Dunkel statement as international approval of the pressure on Japan to open its market.

A wide section in government quarters holds the view that "the Dunkel statement obviously has its origin in the Euro-American pressure on Japan" and is considering taking one countermeasure or another, including a protest to be filed with Secretary General Dunkel.

Of late, the U.S. and European pressure on Japan has been further strengthened against the background of continued business recession. In the United States, Congress and other quarters are making all-out efforts to enact reciprocity bills and, in Europe, the EC Committee has recently announced a plan to file an action with GATT against Japan, saying that "while keeping its market closed, Japan is unilaterally launching an export drive, thus violating the GATT agreement." In either case, they both strongly demand that Japan open up its market.

However, the government is holding fast to the position of defending the free trade system of the Western nations and is put in a situation in which it finds it inevitable to take concrete measures to open up the market. In this case, Japan is expected to notify the Euro-American countries of its plan to further promote the lowering of tariff rates and the removal of nontariff barriers on one hand and take some measure with respect to a review of the import restrictions still in effect on the other hand. A ranking MITI official said, "It may be impossible to go so far as to remove the restrictions, but we will study the expansion of the framework."

CSO: 4120/180

ECONOMIC

GOVERNMENT, LDP TO WORK OUT OPEN MARKET PACKAGE

OW040141 Tokyo THE JAPAN TIMES in English 3 Mar 82 p 1

[Text] Government and ruling Liberal-Democratic Party leaders agreed on March 2 to work out another package of measures to open the Japanese market wider to foreign imports at the earliest possible date.

The agreement was reached at a meeting of economic affairs ministers called by Prime Minister Zenko Suzuki to hear a report on the outcome of a U.S. visit by an LDP mission from its leader, Masumi Esaki chairman of the party committee on external economic relations.

During the mission's U.S. visit last week, U.S. government and congressional leaders expressed dissatisfaction with two earlier Japanese packages for opening its market, and urged the mission to take further measures.

Chief cabinet secretary Kiichi Miyazawa said the government hopes to complete a new program of market liberalization before an economic summit meeting of seven major industrial democracies scheduled for June in Paris.

Miyazawa, however, told the press that before working out such measures, the government must "closely watch" the outcome of the current U.S. congressional hearings on Japan-American relations.

The government also has to "carefully listen" to the U.S. requests on bilateral trade in farm and other goods at a meeting of the Japan-U.S. subcommittee on trade to be held in Tokyo on March 9-10 and learn the result of a planned Liberal-Democratic Party mission to the European communities, he explained.

The LDP mission, also to be led by former International Trade and Industry Minister Masumi Esaki, is due to leave Tokyo for the EC member states around March 10, and will complete its tour of Western Europe by around March 20 when the EC Council of Foreign Ministers calls a meeting to discuss Japan-EC trade problems.

Meanwhile, referring to the contents of the new package, government sources said the government is at a loss as to what measures should be incorporated in it because American requests for further Japanese market-opening measures are not necessarily clear.

The sources said the U.S. appears concerned mainly about expansion of Japanese imports of agricultural products through removal of quota controls and liberalization of the service industries, such as banking and insurance.

CSO: 4120/180

SCIENCE AND TECHNOLOGY

NTT TO LAUNCH SATELLITE VIA SPACE SHUTTLE

Lower Costs Expected

OW250517 Tokyo NIHON KEIZAI SHIMBUN in Japanese 23 Feb 82 Morning Edition p 1

[Text] In view of the importance of communications satellites Nippon Telegraph and Telephone Public Corporation [NTT] has drawn up its own communication satellite development plan by separating communication satellite development from domestic rocket development. This separation stems from the fear that if NTT were to stick to its present course of developing satellites and rockets simultaneously, Japan would lag behind the rest of the world in the communications satellite field.

NTT will shortly consult the Space Development Committee [SDC], the government's space development agency, on the new plan. The SDC is headed by Ichiro Nakagawa, director general of the Science and Technology Agency. The SDC plans to launch a second-generation communications satellite for practical use in fiscal 1987. But at that stage, NTT will separate the combined plan of simultaneously developing rockets and satellites into two separate plans, launching a large satellite, using America's space shuttle, under its own communications satellite development plan. NTT's adoption of a new plan will make it imperative for the Japanese Government to review its space development program.

Space development in Japan has been undertaken mainly by the space development consortium and the Education Ministry's Space Science Research Institute under overall planning and coordination by the SDC, with the cooperation of various organizations such as NTT, NHK and National Research Institutes.

According to the current plan, a "CS-2" communication satellite for practical use will be launched into a stationary orbit by a domestically built N-11 rocket in 1983. The 350-kilogram satellite will have a transmission capacity of 4,000 circuits (in terms of telephone circuits) in 6 submillimeter bands and 2 microwave bands.

Of the total, NTT will use the two microwave bands and four submillimeter bands, with the remaining two submillimeter bands to be used by the police

agency, the national railways and power companies. NTT plans to use this communications satellite for emergency communications during natural disasters and communications with remote islands.

However, the cost of using this satellite is so high, compared with the existing ground circuits, that its use is not profitable unless the communication distance exceeds somewhere between 6,000 to 10,000 kilometers. So it is not practicable for communications inside Japan.

Under the present plan, another communications satellite, "CS-3," is to be launched by a domestically built H rocket in 1987. The weight of the satellite proper is to be 550 kilograms. The projected transmission capacity is 10,000 circuits. But it weighs only half as much as the world's average communications satellite. So it will still be a costly satellite.

That is why NTT has decided to separate communications satellite development from domestically built rocket development at the CS-3 stage and has firmed up a plan to launch a large satellite weighing 1 ton by using the space shuttle, scrapping the 550-kilogram satellite plan. According to NTT's preliminary estimate, when the space shuttle is used, the launching cost will be just one-sixth of the cost incurred using a 3-stage rocket. The transmission capacity will also boost to somewhere between 20,000 and 25,000 circuits. Furthermore, twice as much fuel for attitude control can be packed into the satellite and the satellite's lifespan will be doubled to 10 years, thereby drastically reducing communications costs. Compared with ground circuits, the communications satellite will cost less if the distance covered exceeds 1,000 kilometers.

As a second generation satellite succeeding CS-3, NTT plans to launch a 4-ton communications satellite in 1995. Its transmission capacity will exceed 100,000 circuits and the communications cost will be drastically reduced. Compared with ground circuits, this satellite will cost less if the distance exceeds 300 kilometers.

NTT has no intention of putting these plans into practice separately from the government's space development plan. It will implement them only after the government's space development plan is reviewed.

Project to Face Opposition

OW041215 Tokyo ASAHI EVENING NEWS in English 3 Mar 82 p 3

[Text] Nippon Telegraph and Telephone [NTT] Public Corporation has decided to put two massive business communication satellites into orbit by 1992.

But the plan seems likely to run into opposition from the Space Development Committee headed by Science and Technology Agency chief Ichiro Nakagawa over plans to use America's space shuttle instead of domestically produced rockets.

NTT will launch a one-ton satellite similar to America's successful Intelsat in 1988 to handle the mounting flood of international business communications. While the satellite would contain some 10,000 telephone circuits, it would be a baby compared to the second stage of the project: a four-ton giant that could simultaneously handle 100,000 circuits. It would be launched in 1992.

NTT will debate the proposal further with the Ministry of Posts and Telecommunications and other organizations before taking it to the space committee this summer.

But the summer presentation is not likely to be a rubber-stamp affair.

One of the basic goals of Japan's space program is to build up the country's technological capacity by using domestic technology. However, the H-1A, a three-stage liquid-fuel booster that is Japan's hope for the late 1980s, will only be able to put 550 kilograms into orbit.

That is far short of what would be needed for NTT's business satellites, leading the communication giant to decide that the cavernous cargo bay of the U.S. space shuttle is the only place where its satellites could fly into orbit.

The Space Development Committee already has plans of its own to launch two business communications satellites, the 350-kilogram CS-2, with 4,000 circuits, in fiscal 1982, and the 550-ton CS-3, with a 6,000-circuit capacity, in fiscal 1987.

NTT, however, says demand will far outstrip the limited capacity of the CS series, which it labels uneconomical. It is going ahead with its plans, and has already established a research section for the giant satellites.

"Satellite communications once had an image of being used during disasters, or for communicating with distant islands," NTT official Koji Maeda said. "Satellite communications also cost more than ground-based communications.

"NTT has offered as inexpensive a service as possible, which is why we thought of using the space shuttle at less than one-third the cost of domestic rockets."

A spokesman at the Space Development Committee offices in the Science and Technology Agency said recently that NTT had yet to contact the committee directly. But he warned that any plan to use the space shuttle would run counter to the Japanese space program's policy of using domestic technology.

CSO: 4120/174

SCIENCE AND TECHNOLOGY

IC INDUSTRY'S ACTIVITIES AS OF DECEMBER 1981 REPORTED

Toshiba's VLSI Technology

Tokyo NIKKAN KOGYO SHIMBUN in Japanese 8 Dec 81 p 1

[Text] Toshiba Corporation (Shoichi Saba, president) has developed a dynamic 4-16 megabit dynamic memory (memory element consisting of silicon chips, each a few mm square, containing 4-16 million transistors) capacity revolutionary type VLSI. This technology is called the BOX method and represents a new element separation technology produced by embedding two layers of silicon oxide film within grooves dry etched into silicon base plates, thereby separating and insulating the elements from each other. There are a number of technological barriers which stand in the way of development of VLSI with a minimum line width less than 1 micron and with more than 1 megabit degree of integration, and it has been said that element separation is the most important obstacle to be overcome to realize such a product. The new technology developed by Toshiba eliminates the unused section (bird's beak) which was unavoidable in past methods while making an element separation which opens the way for submicron line widths of between 0.2 and 1.0 micron and associated high densification. It is said that a design line width of 0.6 micron will enable the cramming of 2.38 times the present number of transistors per square centimeter. This company considers that it has established the basic technology for developing VLSI of over 1 megabit capacity, and it hopes to market this product in the latter half of the 1980's.

Element Separation Without Bird's Beak

The memory (RAM = memory element in which read-in and write-in can be conducted freely) with the maximum capacity presently available in the world today is a 64 kilobit member (design line width, 3 microns), and present technology allows production up to 256 kilobits (design line width 1.5-2 microns), but once this capacity goes up to the 1 megabit level (design line width 1 micron), a number of technological obstacles loom. It is generally believed that the development of submicron class VLSI can become possible through the establishment of lithographic technology using electron beam engraving or plasma etching, but the actual situation is that considerably more important technology needs to be developed. This includes manufacturing technology such as: 1) element separation technology by which electrons cannot leak over into the neighboring elements, 2) gate insulating film forming technology of the order of 50 Angstrom thickness, and 3) technology for installing low-resistance distribution lines. Circuit design technology

problems include how to control hot carriers and the creation of new memory circuit designs. In this manner, the 1-micron barrier seems very formidable. This is why there is a general feeling among engineers in the IC industry that "it will be enough if a product with a line width of 1 micron and a 1-megabit degree of integration can be mass produced."

The breaking of this 1-micron barrier is the most important achievement for this element separation technology. Up to the present time, the LOCOS method developed by Phillips Company of the Netherlands has been the most widely used method for MOS type LSI element separation; this method employs silicon nitride film to form insulating film of silicon oxide by heat treatment of 7 hours duration at 1,000°C. This treatment often forms swellings on both side of the oxide film gas mask called a bird's beak (the cross-section resembles a bird's beak), as a result of which an 0.5-micron-wide bird's beak is formed on either side of a 1.0-micron line, and the net effect has been that an effective line width of less than 2 microns could not be attained. At the same time, the appearance of crystal defects is accelerated by the high temperature treatment. Because of this situation, Toshiba developed its element separation method called the "SEPOX method," which enables finishing to 1.2-2 micron, and it had been studying application to the mass production step which followed; however, meanwhile it developed its BOX method, which enables an even finer degree of finishing, to less than 1 micron.

The BOX method involves, first of all, removal of silicon by a dry etching procedure and embedding insulating film into the excavation by a two-step process. The first step leaves only a very thin groove around the element periphery to embed the insulated item, and the second step coats insulating film over the first in a selective manner. Because both the element forming region and the separation region surfaces are flat, it is claimed that this technology can be adapted to the use of optical microprojection lighting devices (steppers) which can operate down to about 0.7 mm at shallow focal depth (large number of openings). Although the BOX method requires a greater number of steps, the time required is shorter (two 30-minute intervals) and the treatment is under comparatively lower temperatures, thereby minimizing any effects to the elements. The company claims that it has produced circuits operating properly with a line width of 0.6 mm by the application of this BOX method.

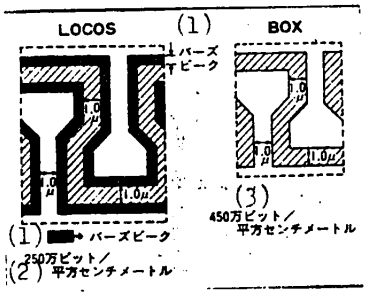
Comparing the degree of integration with a product of the LOCOS method, assuming a design rule of 1 micron design width, a BOX product incorporates 4.5 million bits (transistors) per square centimeter, which is 1.8 times that of a LOCOS product. Going down to a design width of 0.6 micron, there is an increase to 2.38 times, to 12.5 million bits. It is said that a 4 megabit dynamic chip produced by the BOX method will be roughly one-third the size of a chip made by the LOCOS method, at about 70 square millimeters.

These research results were announced on the 8th at the International Electronic Device Society Meeting held in San Francisco.

Ideal Element Separation

Professor Shoji Tanaka, Department of Physical Engineering, Faculty of Engineering, University of Tokyo said: Submicron line width becomes a must if memory is to

attain the megabit level, particularly above the 4 megabit level, and element separation technology is an important adjunct to this technology. The BOX method proposed by Toshiba seems to be an ideal method. There are a number of obstacles to submicron widths such as 0.5 micron, but this method enables good separation, and good transistor properties without the narrow channel effect have been realized. This technology has resolved one of the major difficulties.



Key:
1. Bird's beak
2. 2.5 million bits/square centimeter
3. 4.5 million bits/square centimeter

Production for 1981

Tokyo DENPA SHIMBUN in Japanese 9 Dec 81 p 1

[Text] Increase of 20 Percent Over Previous Year, Close to Half That of the United States

Estimating Japan's semiconductor (semiconductor elements and IC) production based on the production statistics of the Ministry of International Trade and Industry, this will be the first year for attainment of the 1-trillion-yen level. This year's semiconductor element production is expected to show an increase of 370 billion yen over the preceding year, or 28 percent, while IC production is expected to be 690 billion yen over the previous year, or 21 percent. Semiconductors and IC together are expected to increase 20 percent, to 1.6 billion yen. Exports are estimated at 230 billion yen and imports at 130 billion yen, and the flourishing electronics development is the prime mover for this well-founded development. The production ratio with respect to the United States has been increased from the previous 1:5 or 1:3 ratio to close to 1:2, and Japan has secured its position as one of the large semiconductor producing countries of the world.

80 Percent for Domestic Needs

It had been expected from the beginning of the year that semiconductor production would top the 1-trillion-yen mark; the contents of the production items are undergoing changes while overall production is following the lines of the initial progress rather closely.

Abetted by VTR Developments

Increases in VTR for home use have compensated for the poor performance of desk calculators, watches, and memory type LSI use products, and even then there has been a 20-percent level of increase in production, indicating the diversification in semiconductor demands, and there seems to be an indication that a solid foundation for development is being established.

According to the production statistics of the Ministry of International Trade and Industry, Japan's semiconductor-IC production was at the 500-billion-yen level in 1978 and it was expected to exceed 1 trillion yen 3 years later, corresponding to an annual increase of close to 30 percent. The growth in the IC area is close to the very high level of 40 percent.

10 Percent of Electronics Industry Production

A production of 1 trillion yen is roughly 10 percent of this country's expected electronics industry production of 10 trillion yen, and this industry is now capable of production to rival television, VTR, telecommunications, communication equipment, computers, and general electronic products. Every one of the other areas enhances semiconductor development and also uses semiconductor products to abet its progress, making for a very favorable environment.

This is why Japan's semiconductor industry depends on domestic demand for about 80 percent of its production, and despite the increase in exports, the emphasis is on domestic sales. Imports, which are chiefly from the United States, come close to half the export level, and growth in this area is small. On the other hand, Japan-based corporations are making more secure their Japanese markets, indicating that stabilized imports will continue. There will be a decrease in import duty on IC to 4.2 percent in April next year.

In another direction, semiconductor production in the United States, which leads the world in this category, was $9.3 billion (about 2 trillion yen) for 1981, according to figures released in September by the Semiconductor Industry Association (SIA). Reflecting the depressed state of the Western world, this was a 6.9 percent decrease from the 1980 total of about $10 billion. The production for 1982 is expected to be about $10.9 billion.

The American semiconductor makers have plants distributed worldwide and can be said to be promoting multinational activities. On the other hand, a simple comparison of production totals shows the ratio with Japan has narrowed down to 2:1 this year, whereas 5 years ago this ratio was close to 5:1, and only 2-3 years ago it was 3:1. The present situation seems to belong to an altogether different world.

To Retain High Growth Rate From Here On

According to members of Japan's semiconductor industry, even though production will attain the 1-trillion-yen level this year, development will continue unabated, and even though there may be some stabilization in the base, this high rate of

growth is expected to be maintained. The VLSI production which is expected to come onstream about the middle of the decade is certain to have a major impact, and the establishment of overseas plants to avoid trade friction as the result of the impact of such technological innovation is expected to increase.

Where the semiconductor makers are concerned, the assurance of manpower and the development of new technology that will enable them to sustain future growth are major problems, but even the industries within the framework of the industry consider this growth to be assured. It is expected that many other industries are eyeing this area and the entry of new candidates will probably continue.

JEOL Export to Bell

Tokyo NIKKEI SANGYO SHIMBUN in Japanese 9 Dec 81 p 1

[Text] Export of Electron Exposure Device to Bell

The most advanced main device used in the production of semiconductors will be exported to the United States for the first time, according to an announcement by the parties involved in the situation, on the 8th. JEOL [Japan Electron Optics Laboratory] succeeded in receiving an order for its super-high-precision electron beam exposure device for circuit making from the world leader in semiconductor development, Bell Laboratories of the United States. Bell Laboratories intends to use this device as the main cog in the development of VLSI (very large scale integrated circuits), which is expected to become practical in the 1990's. In the past, Japan's semiconductor production technology and production machinery were imported from the United States, and this present order is an indication that Japanese technology has developed to the level of the world's best even in the most advanced areas.

Form 0.01 Micron Unit Circuitry

Technology to form very fine circuits, called "microlingraphy," is the decisive technology which determines the capability of producing semiconductors of the degree of integration required in VLSI. It is in such applications that the electron beam exposure device is replacing the optical exposure device of the past, in a noteworthy trend.

The device which Japan Electron Optics Laboratory (JEOL) is to supply to Bell Laboratories has the capability of engraving line widths, which are a measure of the ease of circuit forming, of 0.01 micron unit, which is the best presently possible in the world. The VLSI 64 K RAM (instantaneous read-in and read-out memory), which has recently come into mass production, has a line width of the order of 2 microns, while the super-high-speed IV being developed by the Defense Department of the United States has a line width of the order of 0.5 micron, and the JEOL device makes possible line widths which are even finer.

Bell Laboratories is looking ahead to the 1990's and is working on new elements such as the Josephson element to be incorporated into VLSI; it decided to make this JEOL device a central part of this production system after a battle for orders. This unit is expected to be delivered next summer to Bell's Murray Hill Laboratory, and the order is said to total about 200 million yen. JEOL plans to use this sale as the icebreaker to engage in serious exports to the United States.

Japan's semiconductor production technology was accumulated initially through importation from the United States, and even now more than half the production equipment used by semiconductor makers is imported from the United States. On the other hand, during the 4-year period starting in 1976, the Ministry of International Trade and Industry took the initiative to form the "VLSI Technology Research Group" to engage in VLSI production, which was the wedge for the rapid emergence of domestic technology and domestically produced equipment. It is said that dry etching devices and VLSI testers used in VLSI production have come to be ranked with the best in the world, and these equipment makers all are eyeing exports to the United States. JEOL is in the position of having cut through the front line.

Bell Laboratories of the United States developed the transistor in 1947, opening the way for the transistor age, and this company has since been the leader in the world in the matter of semiconductor development. So the present situation is equivalent to "bringing coals to Newcastle." Japan's semiconductor products already have rapidly moved to the fore where the world's semiconductor products are concerned, and now its production equipment is basking in the limelight.

Oki's Semicustom LSI

Tokyo NIKKEI SANGYO SHIMBUN in Japanese 10 Dec 81 p 5

[Text] Oki Electric Industry initiated full-scale efforts to cater to the users' needs in the gate array market, which is considered one of the promising areas for the 1980's by the large semiconductor companies. Gate array refers to semicustom (partially according to special order) LSI (large scale integrated circuitry) in which the user makes the decision on the basic circuitry makeup, which the semiconductor maker makes into the final product according to the design submitted. Since Nippon Electric entered the market this month, the battle revolving around gate arrays was suddenly intensified. Oki Electric Industry has just established its gate alley production system at its VLSI production stronghold at the Miyazaki plant (Miyazaki Oki Electric) and has embarked on production mainly of CMOS (complementary metal oxide semiconductor) gate array developed for the so-called first watch use semiconductor.

Design at Hachioji, Final Process at Miyazaki

Oki Electric entered into a "3 M conflict" in order to reinforce its semiconductor sales strategy this year. The 3 M conflict is the emphasis on sales activities involving three areas--memory, micons, and master slice. Master slice is this company's special reference to gate arrays.

Together with the 64 K RAM (instant read-in and read-out memory), which it plans to produce at the rate of 300,000 per month by the end of next March at its Miyazaki plant, will be the positioning of the third member gate array production project.

At the present time, this company's gate array products include the "MSL 82000/84000 series" for the TTL (transistor-transistor logic circuit) and the "MSM 60300/60700/61000 series, for CMOS structures, both of which possess thousand gate (a gate is the minimum unit of logic circuits) class capabilities, and this company is picking up orders for development from users and requests for production.

This company has a CAD (computer aided automated design) system at its Hachioji plant in Tokyo, which is the base for production and development of semiconductor products by the Semiconductor Device Industry Department as part of its production system, which designs a series of circuit designs such as logic simulation, timing simulation, and automated master pattern design. At the same time, the stage is set for the Miyazaki plant, which has VLSI production line facilities, to put in the finishing touches, including circuit distribution lines.

The record of orders includes many of the large instrument makers in the country as the main customers, but "there are limits to the number of technologists who can handle circuit design and logic design, and we cannot handle as many orders as we would like" (Director Shimitsu Sawamura of the Electronic Device Industry Headquarters).

This is why plans are for further reinforcement of technological support of the gate array area, and "gate array sales of 1 billion yen in 1982" are anticipated.

VLSI War in Japan

Tokyo NIKKEI SANGYO SHIMBUN in Japanese 18 Dec 81 p 1

[Text] The VLSI (very large scale integrated circuit) war is belching flames. This is the result of Hitachi Limited having decided last August to enter into sales of the ultimate product, the 256 kilobit RAM (instantaneous read-in and read-out memory). Sales conflicts in the semiconductor industry have been of the "first move, certain victory" pattern; companies such as Nippon Electric, Toshiba Corporation, and Fujitsu lost no time in becoming fiercely embroiled, and the American semiconductor makers have come forth with a volley of return fire. Industries on the users side have been reinforcing research and development capabilities to make practical use of the latest technology and shift to electronics through establishment of long-term business plans, even to the point of revolutionizing business concepts. This acceleration to a greater degree of integration of VLSI is making a large impact not only on the semiconductor industry but on the technological development conflict covering the entire industrial society.

Users Will Also Rise or Fall with Practical Application

Next fall, Hitachi plans to initiate production of the 256 K RAM at its Musashino plant in Kokubunji, in the Tokyo metropolitan area, and send out samples to a

hundred or so prospective users and seek orders. It also hopes to have a mass production capability of 100,000 units per month by the spring of 1983.

Casting sidelong looks at Hitachi's activities, near the end of October Nippon Electric started construction of a new facility at its Sagamigahara plant (Kanagawa Prefecture). This will be the world's largest class VLSI production facility, for which a total of 27 billion yen has been earmarked, and mass production of the 256 K RAM will be started in FY-83. Fujitsu is pushing research on its super-high-speed semiconductor element HEMT (high degree of electron mobility transistor) with computing speed of 1 nanosecond (one-billionth of a second, the time required for light to travel 30 centimeters) at its Kawasaki Laboratory in Kanagawa Prefecture, and increasing the degree of integration of this unit is the top research subject at present.

Toshiba has completed development of its static type 64 K RAM, which has roughly a 400,000 degree of integration on a chip a few millimeters square, which it plans to place on the market next March. All the other companies have been pushing toward development of next-generation VLSI.

The American semiconductor makers, which saw their domestic market being rudely upset by the invasion of the Japanese 64 K RAM, are displaying signs that they will launch a counterattack in the area of the 256 K RAM. A fire has been lit on the subject and an anti-Japanese attack under the guise of trade friction, and the supply of leading technology to Japan and moves to locate plants in Japan are now becoming specific.

Incited by Hitachi's 256 K RAM strategy, the latent capabilities of other domestic and foreign makers have surfaced and they are expected to speed up greatly their development and sales plans on the next generation VLSI; the semiconductor industry is seeing the total competitive strengths of its individual members being reinforced. One of the principal factors responsible for the FY-82 plan requirement for funds from the financial market continuing at a high level is said to be the large fund requests on the part of the semiconductor industry.

On the other hand, the emergence of the 256 K RAM has had a major impact on the industrial world. "If VLSI production is left to special makers, and a company regards this as a black box, the future of car electronics will be left in a state of instability." (Director Kenichi Watanabe, Electronics Laboratory, Central Laboratory, Nissan Motor Co.). Nissan is putting strength into its own independent research. The same situation of soundness, precision, and equipment confronts every industry which plans to engage in electronics, and each company is rushing to establish new intracompany systems to come up to the VLSI age. An investigator for a certain large bank said: "From now on the banks will be more concerned with evaluating technological strength in place of real assets strength." In other words, VLSI is even altering the management of financial organs.

Hitachi's 256 K RAM Mass Production

Tokyo NIHON KEIZAI SHIMBUN in Japanese 18 Dec 81 p 1

[Text] Hitachi Limited announced on the 17th that it plans to start production and marketing next fall of the 256 kilobit RAM (instantaneous read-in and read-out memory), which is the large capacity memory for the VLSI (very large scale integrated circuit) which is presently the key to the electronics revolution. A 256 K RAM can retain roughly 30,000 bits of information on a base plate a few millimeters square, and the powerful semiconductor makers of Japan are waging fierce battles to market this item. Hitachi was successful in completing its experimental phase so as to begin embarking on commercialization at an early stage. Once this product comes on stream, high-performance computers the size of ordinary television sets will become possible, robots with capabilities very close to man's can be developed, and household electronics will see great strides forward. This alone should have a major influence on Japan's pursuit of the leading technology, which has been intensifying recently.

Development at the laboratory stage has been under way in a number of other companies, such as Nippon Electric and Fujitsu, but Hitachi is the first to enter actual production and sales. It plans to send out samples of its product to a hundred or so large users next fall and to start sales. Once the users have tested the performance of this product, orders are expected to come in starting about the spring of 1983, at which time this company plans to start production of several hundred thousand units per month, expanding this production to the million units per month level from the latter half of 1983 to the first of 1984. Production is expected to be at the Musashino plant in Tokyo, where construction of the most recent production line facility has quietly been under way. The talk in the world's semiconductor industry had been that the real appearance of the 256 K RAM would be about 1985 (Showa 60), but Hitachi greatly advanced the date of initial production and sales as if to refute this story and to launch its attack to expand its share (fraction of the market one supplies) and regain the top seat in the semiconductor market, which Nippon Electric took over in the 1970's, and to close in on the world's top semiconductor maker, Texas Instruments (TI).

The 64 K RAM, which is the main VLSI product on the market at present, has suffered a sharp drop of about 10 percent during this past year and the companies are trying to weather this production battle in the face of unexpectedly poor conditions. At the same time, the principal markets for semiconductors such as audio, VTR, and desk calculators are cutting production, and the sharp growth which was experienced in the past is no longer easily attainable. In this respect, Hitachi seems to be looking for a new market with the introduction of this high-performance product.

Since the fourth ranking semiconductor maker in the world, Hitachi, has taken the lead to come forth with the production of the 256 K RAM, it has become imperative that the domestic and foreign semiconductor makers also venture into the same area. In the particular situation of the American semiconductor makers, who saw the Japanese makers precede them into the 64 K RAM market, it seems very possible that they will put up a fierce counterattack to avoid having their position usurped

once more by the Japanese in the matter of the 256 K RAM. Increased criticism of expanding Japanese LSI imports is expected, as well as efforts to introduce the superior Japanese mass production technology. At the same time, there may be efforts to enter into plants in Japan utilizing Japanese business resources.

As the Showa 40 decade (1965) was entered, low-cost desk calculators and watches with IC (integrated circuits) suddenly became popular and changed people's habits from the use of high-priced calculators and watches to low-cost throw away types. Should the 256 K RAM--which has roughly 1,000 times the memory capacity of the IC and which is expected to be the cause of electronifying all the various industrial areas--become a reality, certainly great changes are forthcoming to the industrial world.

The emergence of the 256 K RAM has reinforced the Japanese semiconductor industry's ability to compete and it is expected to be a great impetus to the electronics revolution.

Sharp's 64 K RAM Production

Tokyo NIKKAN KOGYO SHIMBUN in Japanese 18 Dec 81 p 13

[Text] Sharp (Asahi Saiki, president) announced that it will start production next spring of the 64 kilobit RAM (instantaneous read-in and read-out memory) at a monthly rate of 200,000-300,000 units, together with an all-out plan for semiconductor production. Up to the present time, this company was involved primarily with CMOS (complementary metal oxide film semiconductor) ROM (read-out memory) where memory was concerned, but it entered the 64 K RAM mass production picture as all the semiconductor companies began reacting to increased production of the 64 K RAM. It expects to put up half of this production for external sale. At the same time, the CCD (charge coupled element), which is basking in the limelight as a new electronic eye, has seen the partial transition from the laboratory to the semiconductor industry department, and starting production will be 20,000 to 30,000 units. In addition, sample shipments of the 16 bit micron (Xylog system = Z-8000) have been started, and preparations for mass production are under way. This filling in of the lineup, and the buildup in capabilities are expected to increase monthly production from the present 5 million semiconductor units to 6 million units by next spring.

Nippon Electric and Hitachi Limited announced previously that they will increase their monthly production of the 64 K dynamic RAM to a million units each, and both these companies are engaged in a fierce contest to increase production. On the other hand, there are also some sharp price cuts, and the market is undergoing extreme fluctuations. For Sharp to start making provisions for production of the 64 K RAM is the result of "We were watching the situation while we were shifting use to other units such as the 16 K" (Director Tadashi Sasaki). In addition, in the past this company was in the top class in the matter of going from electronic translators and word processors to the 256 KROM. "We cannot deny that we have been late in developing RAM related areas, but demand for the 64 K suddenly increased, and a reasonable state has developed" (Director Yasashi Inouchi, Semiconductor Industry Department) as the rationale for going into mass production was explained.

At the same time, CCD represents VLSI technology involving the placing of 200,000 elements on a chip a few millimeters square, and its development has been under way at the Central Laboratory. Future plans call for improving the resolution further as well as improving the yield. Part of this work will be shifted to the Semiconductor Industry Department, but a program of parallel operation between the department and laboratory will be adopted. In addition, there has been a sharp increase in orders for photosensors, along with the start of exporting telephone use LSI, and there are many bright prospects. The photosensor is a single sensor, and efforts are also being directed at making optical IC where there are no peripheral circuits and the sensor and logic circuit are coupled directly.

Along with increased production has been reinforcement of the research and development front, and the semiconductor laboratory will be made independent of the Central Laboratory. This plan will be activated next July; work will start first on the 256 K RAM and the 1 megabit ROM, and research and development will be directed at the entire semiconductor area, including revolutionary compound semiconductors and three-dimensional semiconductors.

Reverse Export of Semiconductor Technology to the American Rockwell Company

(New York, 16 December) Involved parties announced on the 16th that Sharp will supply production technology for semiconductors to Rockwell International, which is the parent company of the large American air and space company, which also has electronic subsidiaries; general agreement in principle has been reached. This technology supply agreement contract is to be signed next January.

This involves the so-called CMOS type semiconductor technology, which features low power consumption. Sharp introduced technology from Rockwell in 1970 to initiate semiconductor production, but it has since gone into desk calculator and watch production, during the course of which it developed its independent semiconductor technology. There was a request from Rockwell for introduction of the Sharp technology, and the talks were started. Where once the technology was obtained from the American side, the situation now is that the reverse process is taking place, making for an interesting situation.

Matsushita's 8 Bit A/D Conversion LSI

Tokyo NIKKAN KOGYO SHIMBUN in Japanese 23 Dec 81 p 9

[Text] Matsushita Electrical Industrial (Toshihiko Yamashita, president) and Matsushita Electronic Industry (Seiji Miyoshi, president) announced on the 22d that they had succeeded in becoming the first in Japan to develop and market a super-high-speed, low power consumption 8 bit A/D conversion LSI "AN6857" for graphics treatment through their "LOPAC technology," which is their independent semiconductor fine finishing technology. Production is at the Matsushita Electronics Arai plant (Niigata Prefecture), and sample sales will be initiated starting next March. The sample price will be about 150,000 yen per unit. This type of LSI has been imported from the TRW Company of the United States at the rate of about 10,000 units per year. Compared to the imported product, this new unit

consumes roughly 700 milliwatts or about one-third the power consumed by the imported product, while the maximum conversion rate is 50 magabits/second, which gives this unit twice the performance. These companies are anticipating increased demand for industrial applications.

The A/D conversion LSI is an integrated circuit which converts analog signals to digital signals. Digital technology is the best mode for bringing out the best in electronic equipment quality and diversification and is considered a must for future television, video, intelligent robots, and ME equipment. When used for graphics treatment, not only is there no deterioration in picture quality but the information can be stored in floppy discs, from which it can be retrieved at any time, making possible computer treatment and enabling the breaking of the technological barrier which has beset analog technology. Conversion modes include the so-called "scale" mode, which in the past involved the use of micons and the successive comparison mode such as in PCM audio; however, treatment time by either method is slow, making them unsuitable for graphic treatment. This new A/D converter uses what is called a parallel comparison mode in which 256 resistors along with corresponding comparators are used, enabling super-high-speed treatment. Its speed is said to be 1,000-2,000 times that of the audio mode.

The technological difficulty is said to be at the VLSI level. This is because a bipolar integrated circuit is used (which uses electrons and positive holes to achieve amplification, which is a technology where integration is difficult. Where once the limit to the number of transistors confined in a several-millimeter area was of the order of 1,000 units, this new unit accommodates about 8,000. This has necessitated the fine pattern width being reduced from 6.7 microns to a 3-micron level. Despite this refinement, there is no decline in the voltage it can withstand, 10 volts, and precision has not suffered. The differential gain is 1 percent and the differential phase is the superior value of 0.5 degree, which gives promise of an ability to respond to the high quality demands of graphics treatment such as for broadcast purposes. This development was possible through the "LOPAC technology" developed by these two companies, and the present A/D conversion LSI is the first practical application. These companies will go into all-out development and commercialization of various devices applying this new LSI.

Mitsubishi's 64 K RAM Mass Production

Tokyo NIKKEI SANGYO SHIMBUN in Japanese 24 Dec 81 [page not given]

[Text] Mitsubishi Electric is to greatly increase production of the 64 K RAM (instantaneous read-in and read-out memory), which is the entry product to VLSI (very large scale integrated circuits). The initial plans called for monthly production of 300,000 units by the end of next March, but this scale has been increased to 500,000 units per month. There has been a great increase in demand for 64 K RAM both in the domestic and foreign markets, along with the earlier than planned purchase of high-level production equipment for VLSI use which are responsible for this move. In semiconductor industrial circles, both Nippon

Electric and Hitachi Limited announced plans to produce 1 million 64 K RAM units by next March, forcing this company to push ahead its plans to close in on the other companies.

Determined Chase of Nippon Electric and Hitachi

Sales of the 64 K RAM by Mitsubishi Electric have increased sharply. Sales in the principal American market for the third quarter period of 1981 (July-September) represented a 4.6 fold increase over the second quarter period, to 320,000 units. The share for the same period attributable to the 64 K RAM climbed to 9.2 percent (it was 4.0 percent for the second quarter period), and this record put this company in third place among the Japanese makers, next to Hitachi and Fujitsu.

Sales of the 64 K RAM are still increasing in the American market during the fourth quarter period, and it is said that orders are coming from many new large users. At the same time, use of this unit is increasing in the computers produced by this company in Japan, while computer peripheral and terminal equipment seems to have been stimulated by the lower market situation, and sales to games makers have increased greatly.

In response to these changes, this company had already laid plans in September to increase production of its 64 K RAM from 150,000 per month to 300,000 per month, but because of the unexpected buildup in demand, it decided to increase production to 500,000 units per month. Construction to enable this increased production is being pushed at the Kumamoto No 2 plant, and facilities to produce 250,000 per month will be ready by this December.

In addition, provisions for acquiring high class semiconductor production equipment for VLSI, the bulk of which is imported from the United States, are being completed much sooner than had been anticipated, and this is also one factor abetting this large increase in production. Because of the instability of the American semiconductor industry, the present semiconductor production equipment makers are putting greater efforts into sales directed at Japan, and delivery dates have been greatly accelerated.

With this large increase in 64 K RAM production on the part of Mitsubishi, the domestic VLSI conflict is expected to become even more fierce.

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SCIENCE AND TECHNOLOGY

RECENT ACTIVITIES IN INTEGRATED CIRCUIT INDUSTRY REPORTED

New Function Element Research Foundation

Tokyo NIHON KEIZAI SHIMBUN in Japanese 4 Aug 81

[Page numbers for all items not given]

[Text] Hitachi Ltd, Fujitsu Ltd, Matsushita Electric Industrial Co, and seven other representative Japanese manufacturers of heavy electrical equipment, computers and household appliances have decided to join together for the purpose of research and development of new types of high-performance semiconductors which are essential to advanced technology for such areas as development of outer space and creation of subminiature computers that can be held in the palm. On the afternoon of the 4th they will establish the New Function Element Research Foundation (to be headed by President Jowa Shindo of Mitsubishi Electric Corp). The Ministry of International Trade and Industry (MITI) has taken a positive stance with regard to fostering basic industrial technology for the next decade--its goal being "a technological power for the 1990's--and so 10 companies in Japan which pride themselves on advanced technology have set about to create a structure for joint research at the private level. They decided on the foundation format in order to fend off foreign criticism that "government and private enterprise have joined together to foster a high-technology industry," and to enable a flexible response in the event that European or U.S. manufacturers ask to participate in projects. In view of the high level of technology among the companies involved, the results of research can be expected to gain international attention.

MITI's Agency for Industrial Science and Technology wants to allocate more than 100 billion yen in research and development funds for the 10 years beginning with FY-81 for all basic industrial technology for the next decade. The development of new semiconductors, including superlattice elements, three-dimensional circuit elements and high-tolerance elements (new function elements) will be a national project with a planned research budget of about 25 billion yen. MITI has decided that it will soon recruit agents to handle research and development of new function elements.

The 10 participants in the New Function Element Research Foundation will be the heavy electric equipment and computer companies Hitachi Ltd, Toshiba Corp, Mitsubishi Electric Corp, Fujitsu Ltd, Nippon Electric Co and Oki Electric Industry; the Kansai home appliance manufacturers Matsushita Electric Industrial

Co, Sanyo Electric Co and Sharp Corp; and Sumitomo Electric Industries, which has recently gained much attention for its optical fibers and synthetic semiconductors.

The New Function Element Research Foundation will carry out research and development on three new types of high-performance semiconductors: 1) superlattice elements which can perform arithmetic operations at ultrahigh speeds; 2) three-dimensional circuit elements which layer elements vertically from the surface; and 3) high-tolerance elements which will remain stable in hostile operating environments.

If superlattice elements materialize, computer arithmetic capabilities will speed up several hundred-fold and operation at normal temperatures will become possible. If three-dimensional circuits are created, the scale of integration can be increased 40 or 50-fold and superminiature computers which fit in the palm of the hand will become commercially feasible.

Elements with a high tolerance of operating environments can be used in outer space (subjected to high levels of radiation) and will be suited to satellite electronics and atomic reactor control equipment. As resistance to heat and vibration increases, it will become possible to incorporate computers in industrial equipment.

Establishment of Foundation

Tokyo DEMPA SHIMBUN in Japanese 5 Aug 81

[Text] On the 4th, 10 companies representative of Japan's heavy electronic equipment, computer, telecommunications and home appliance manufacturers established the New Function Element Research Foundation (headed by President Jowa Shindo of Mitsubishi Electric Corp) for research and development of new types of semiconductors.

This will serve, in connection with the MITI Agency for Industrial Science and Technology's national project of developing basic industrial technology for the next decade, as a channel for the research and development budget of about 25 billion yen planned for development of superlattice elements, three-dimensional circuit elements and high-tolerance elements.

MITI is to give its approval on 13 January.

Ten companies will participate in the New Function Element Research Foundation: the heavy electric equipment, computer and telecommunications companies Hitachi Ltd, Toshiba Corp, Mitsubishi Electric Corp, Fujitsu Ltd, Nippon Electric Co and Oki Electric Industry; the Kansai home appliance manufacturers Matsushita Electric Industrial Co, Sanyo Electric Co and Sharp Corp; and cable and optical fiber manufacturer Sumitomo Electric Industries.

MITI will invest 670 million yen from its 1981 budget. The foundation plans to begin research and development as soon as this September.

Foundation Projects

Tokyo NIKKEI SANGYO SHIMBUN in Japanese 6 Aug 81

[Text] The New Function Element Research Foundation, a national project to create next-generation semiconductors which surpass the capabilities of the silicon semiconductors now being sold, has made its start. To create capabilities not available in the most advanced VLSI's (very large scale integrated circuits) today, it plans to invest a total of 25 billion yen over the next 8 to 10 years. The technology which will serve as a model does not exist overseas as was the case with past high-performance computers and VLSI development projects; the challenge is presented by completely unexplored technology. For that reason the "research foundation method," not seen in MITI's earlier national projects, has been introduced; government and business are to combine their strength to carry out lengthy research and development.

Recruitment of groups which wish to participate in research and development of new function elements began on the 5th. The New Function Element Research Foundation (headed by President Jowa Shindo of Mitsubishi Electric Corp) was inaugurated the previous day; in actuality, the foundation will do research and development as an agent of MITI's Agency for Industrial Science and Technology. This is a method of development by a purely private organization.

This method was adopted because the technology involved is completely new, and so the foundation will have to deal with patents and promulgate the results after development. And because development will take a long time, a project manager with specialized knowledge will administer the overall research plan from within the foundation.

At present the foundation has 10 members: computer companies Hitachi Ltd, Toshiba Corp, Mitsubishi Electric Corp, Fujitsu Ltd, Nippon Electric Co and Oki Electric Industry; the Kansai home appliance manufacturers Matsushita Electric Industrial Co, Sanyo Electric Co and Sharp Corp; and Sumitomo Electric Industries, which has put its efforts into optical telecommunications. Other companies, however, will be allowed to join the foundation at any time. Even Japanese corporations of European and U.S. companies will be able to participate.

The foundation will begin research and development on three topics as projects commissioned by the government: superlattice elements, three-dimensional circuit elements and elements with a high tolerance of operating environments, but peripheral technology will be developed independently by the companies whose contributions the foundation recruits.

In the case of superlattice elements, research will center on synthetic semiconductors to replace silicon on the basis of technology put forward by Dr Reona Esaki of IBM. If it succeeds, it will lead to computers which can calculate at

several hundred times the p.esent speeds. The technology will be the most difficult of the three topics because it will involve research in new materials.

Present VLSI's pack 100,000 or more elements onto a silicon surface a few millimeters square; three-dimensional circuit elements will "stack" such surfaces in two or three or more layers. One LSI chip now can store about 100 Chinese characters, but if the three-dimensional elements materialize, it will immediately become possible to store several thousand characters per chip. It will also become possible to build hand-held word processors. The ultimate goal is to stack up 10 layers, but even two layers would yield a great advance over VLSI capabilities.

The high-tolerance elements are to be IC's with unusually great resistance to vibration, shock and radiation. Simple versions are already in use in the United States for military, space flight, atomic reactor instrumentation and automotive applications. But development of elements integrated on the scale of LSI's and VLSI's is a matter for the future. Because this will be in part an extension of present technology, it is thought that these elements can be developed in 8 years, 2 years sooner than the other two.

The present advanced microcomputers rival the capabilities of the large computers of the past. There are more and more opportunities for manufacturers in the fields of home appliances and telecommunications, as well as computer manufacturers, to introduce semiconductor technology into new markets such as OA (office automation) and unmanned factories. The plan to develop new function elements will bring together in one place the manufacturers in various fields which harbor such intentions.

Oki's 256K RAM

Tokyo Nikkei Sangyo Shimbun in Japanese 11 Sep 81

[Text] Oki Electric Industry Co revealed its next-generation VLSI (very large scale integrated circuit) memory development plan on the 10th. In addition to completing testing on its 256 kilobit dynamic RAM (random access memory) high-speed mask printed ROM (read only memory), Oki has begun planning of a 64 kilobit static RAM and a 128 kilobit EPROM (erasable programmable read only memory). As the development of these memories goes forward at a rapid pace in the VLSI section of the technical research laboraroty in Tokyo/Hachioji, the VLSI mass-production plant at Miyazaki Oki Electric Industry Co (Kiyotakemachi, Miyazaki) began full-scale operations at the end of August. Because it is equipped, from research and development through mass production, Oki plans to join the group of world leaders in the VLSI field in a year or two.

What are being developed now are VLSI memories of the next generation which have minimum line widths of 2 microns. Under Oki's product plans, samples of the 64K EPROM (MSM2764) will be shipped early next year, followed by the 256K high-speed mask printed ROM (MSM38256).

In 1983, the 256K static RAM (MSM37256), the 128K EPROM (MSM27128) and the 64K CMOS static RAM (MSM5188) will be available. A 1.5-mitron 4 megabit ROM is scheduled for completion by the end of 1984.

Of this stream of Oki VLSI memories, the most noteworthy is the 256K dynamic RAM. Academic announcements of such a memory have been made by Nippon telegraph and Telephone Corp and by NEC-Toshiba Information Systems, but Oki is the first to announce a tested product.

The memory Oki has announced can be used to store 256,000 characters at 1 character per bit with an access time of 100 nanoseconds (1 second = 1 billion ns), a cycle time of 200 ns, and power consumptions of 300 milliwatts during operation and 28 mW standing by. It uses a 5-volt power supply and fits in the same 16 pin ceramic package as the 64K RAM. The size of a cell to store one bit is 6 x 13.5 microns, and the chip measures 9.76 x 4.89 mm.

Because Oki did not participate in the MITI-guided joint government/private "next-generation computer VLSI research and development" project which was completed in March 1980, it was considered a late starter in this field. Nevertheless, at the beginning of this year it announced the 64K dynamic RAM (MSM3764) and the 1M mask printed ROM (MSM28100), which were completed with the technical cooperation of the Musashino Telecommunications Laboratory of Nippon Telegraph and Telephone Corp.

Using its own technology, Oki has developed and produced the 128K high-speed mask printed ROM (MSM38128), the 32K EPROM (MSM2732), the 16K static RAM (MSM2128) and the 16K CMOS (complementary metal-oxide film semiconductor) printed static RAM (MSM5128). These used VLSI technology with a 3-micron (1 micron = 1,000 mm) minimum line width.

Hitachi's 64K RAM

Tokyo NIKKAN KOGYO SHIMBUN in Japanese 22 Sep 81

[Text] In the second quarter of 1982, Hitachi Ltd (Katsushige Mita, president) plans to announce a high-speed 64K dynamic RAM with an access time of 120 ns. This will represent a full response to the demand for high-speed 64K chips for computer main frame memory in 1982, and a diversification of 64K products. This high-speed HM4864A will be Hitachi's third 64K chip, joining the ceramic or cerdip [ceramic dual inline packaged] HM4864 (access times of 150 and 200 ns) and the plastic packaged HM4864P (same access time) which will be available beginning 1 October.

Hitachi now produces 500,000 64K DRAM per month, and has plans to produce 700,000 per month by the end of the year; it has been battling with Fujitsu Ltd for top place in the world 64K RAM market.

But the present 64K chips are used primarily for peripheral terminals and for microcomputers which require miniaturization; they have not been adopted for the main memory of large computers, and so demand has not yet fully developed. The price of 16K memory dropped sharply for that reason; 64K memory has also come down, but it is not yet near to or below the cost per bit of the 16K.

Another consideration is that the performance of the 64K chips cannot rival that of the 16K. The fastest 64K access time at present is 150 ns, a speed inferior to

the 120 ns chips on the market and the 100 ns 16K chips Hitachi uses in its own computers. Thus, although Hitachi sells 64K memory, it still uses 16K rather than 64K in its most advanced large computers; improvement of the speed aspect is one task involved in replacing 16K memory with 64K. INMOS, the British national VLSI company, also hopes for a high-speed 64K chip and is developing a 100 ns product; samples have now begun to be shipped to Japan.

The high-speed type Hitachi says it will sell beginning in the second quarter of 1982 will have an access time of 120 ns and will be in a cerdip package. Both the mask and the chip size will differ from earlier 64K chips. They will not be produced by shrinking to 2 microns; a 3-micron process will be used. Hitachi has also revealed that it has begun to develop a 100 ns product to follow the 120 ns chip; it intends to bring out a product line to respond to the 64K market.

NEC's 256K RAM

Tokyo NIKKAN KOGYO SHIMBUN in Japanese 2 Oct 81

[Text] Nippon Electric Co (Tadahiro Sekimoto, president) has succeeded in developing a truly VLSI 256 kilobit dynamic RAM (random access memory of the dynamic type) with a high-speed access time of 100 nanoseconds. NEC attracted attention in February 1980, when NEC-Toshiba Information Systerms announced the world's first practical 256K chip; now it has developed a new 256K memory (NEC V7607) with a 1.5-micron rule using existing stepper technology along with NEC's "soft error" strategy and improvements in terms of speed. This is a very practical item which can be mass-produced immediately if the demand exists. It is packaged as a 16 pin DIP, and the pin arrangement is completely compatible with 16K and 64K memories; it is expected to become the world standard of 256K memories. The fact that Japan's semiconductor industry has put out a VLSI product which leads the world should be noted as evidence that it has caught up with the United States in the development aspect as well.

There was a previous announcement of development of a 256K chip, but it was inadequate in terms of speed--although an access time of 150 ns is adequate for present computers, it is not really suited to the high-speed systems of the future--or of measures against "soft errors" from alpha radiation (the phenomenon whereby occasional errors arise from low-level radiation from the packaging material). Consequently, NEC has developed a component which is more practical in those two regards. This time, as previously, the mask (reticule) was produced with an electron beam using a 1.5-micron rule. Only practical, existing technology has been used, including an exposure device with a 10:1 reduction ratio, the dry etching method and an ion injector for diffusion of impurities.

The component is characterized by the following: 1) it is mounted in a standard 16K pin case and its pin allocation is compatible with present 16K and 64K memories; 2) delay is reduced by using molybdenum rather than polysilicon for internal circuitry, and so (typical) access time is sped up to 100 ns; 3) the condenser film is thinner and the volume of the memory cell is slightly larger, and a chip coating is used--soft errors from alpha radiation are thus reduced to a level of

1 per 200,000 device hours. Moreover, power consumption is 300 mW, the same as the 64K, and there is no problem with generation of heat.

Primary specifications: 262,144 words x 1 bit; 100 ns access time; 270 ns access time; 16 pin dual inline package; +5V single power source; 0 to 70 degrees C operating temperature; TTL level input and output; 300 mW (active), 20 mW (standby) power dissipation; 256 cycle refresh cycle; 4 ms refresh time; 6.25 x 11.5 micron cell size; 4.96 x 9.63 mm chip size.

Big Price Drop

Tokyo NIKKEI SANGYO SHIMBUN in Japanese 16 Oct 81

[Text] There has been a big drop in the price of semiconductors--IC's (integrated circuits), LSI's (large scale integrated circuits) and so on--that form the mainstay of the electronics revolution. Specifically, the price of the 64 kilobit RAM (random access memory), which arrived with the opening of the VLSI era, has dropped 90 percent or more in the past year; the all-out price competition for this product of advanced technology is appalling. Recently the suppliers of America's "Silicon Valley," anticipating the cut in Japanese semiconductor tariffs in Arpil 1982, have intensified the VLSI price war by attacking with decisive price cuts.

This October, 64K RAM's have begun to appear in some spot distribution markets at 1,000 yen apiece. This product, the VLSI "entryway," was first announced to the world by Fujitsu Ltd 3 years ago, and is now produced by more than 20 companies in Japan, the United States and Europe. When sample shipments got underway last fall the price was 20,000 yen, but it dropped to 2,000 yen by the time companies were geared up for mass production in the second quarter of this year, and recently they have become as cheap as 1,000 yen.

The computer industry and other 64K RAM users had expected the price to drop by some percentage when mass production began, but the recent drop was much greater than expected. The 64K RAM arrived on the scene about 4 years after the era of the 16K RAM began, but the unit price of the 16K RAM was 1,000 yen 3 years after it began to be mass-produced and widely distributed. The 64K RAM, by contrast, dropped to that low price in only 1 year. This has stimulated the users' desire to buy and hastened the VLSI era.

As the degree of integration of memory circuits has increased, the price per bit of memory has dropped greatly. (See accompany graph) With a market price of 1,000 yen, the price per bit was 1 yen in the 1K era, but with 16K chips it is 6 sen, and with 64K chips it has become 1.5 sen per bit.

This price weakness has spread to the most sophisticated semiconductors--the microprocessors and memories. The 16K microprocessors and 16K EPROM's (erasable programmable read-only memories) which have begun to be sold this year are in the VLSI class of semiconductor technology. Although a full-scale effort to see these advanced technological products to users has not been made yet, they have recorded price drops of 90 to 95 percent in only half a year. In the competition of this confused market, the manufacturers of Japan and the United States have found that (in the words of a major producers of semiconductors) "the price is moving like a phantom before the product is even available."

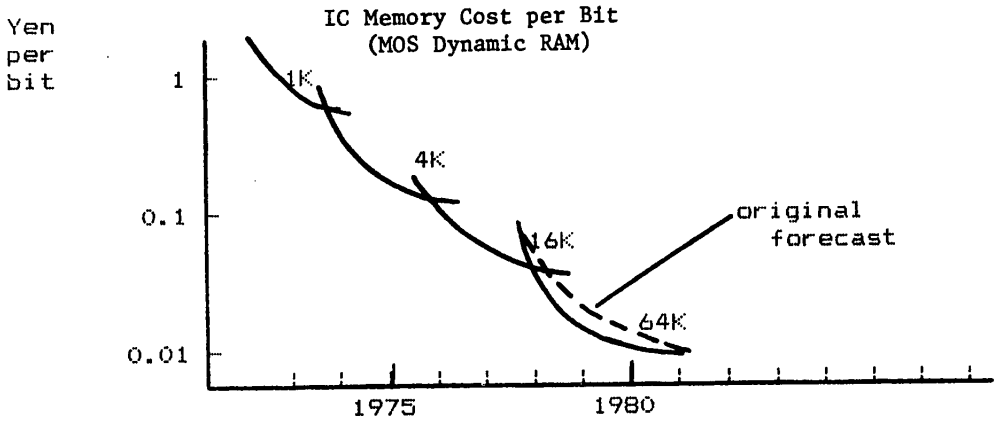
The 64K RAM is a strategic product for the survival of Japanese and U.S. semiconductor manufacturers in the market competition of the VLSI era. The phenomenon of price drops, which could also be called a "price breakdown," has continued for that reason.

This price war has been escalated by a series of price offensives by U.S. forces such as TI (Texas Instruments). These U.S. companies have dropped to a 20 percent share of the Japanese market with the rapid growth of domestic companies such as Nippon Electric Corp, Hitachi Ltd and Fujitsu Ltd, which have the strength to elicit a "Japanese-U.S. Semiconductor War." The dominant view within the Japanese semiconductor industry is that the final agreement between Japan and the United States on IC tariffs was the trigger for the recent rollback by Silicon Valley.

Under this Japanese-U.S. agreement, the duty, which was double that of the United States, will be cut to 4.2 percent in April 1982. The U.S. products which have been kept out of the Japanese market by this tariff barrier will now be quite capable of competing in the price war. Both the U.S. companies, which have sought to gain an advantage in the fight for market shares in advance of the April tariff reductions, and the Japanese companies, which have fought against them, have had to use price as their weapon. It appears that the time for sifting out the semiconductor producers which are unable to compete in the price war will be coming sooner than had been expected.

64K RAM Production Plans of Major Semiconductor Manufacturers
(thousands of units in the second half of fiscal 1981)

Company	Mass Production Plant	Present Level	Plan
Hitachi	Musashi plant (Kodaira, Tokyo)	700	increase
Fujitsu	Aizu plant (Wakamatsu, Fukushima)	600	increase
NEC	Kyushu NEC (Kumamoto, Kumamoto)	300	increase
Toshiba	Oita plant (Oita, Oita)	300	level
Mitsubishi	Kumamoto #2 (Nishigoshi, Kumamoto)	300	increase
Oki	Miyazaki Oki (Kiyotake, Miyazaki)	300	level



NEC's Factory for 256K RAM

Tokyo NIHON KEIZAI SHIMBUN in Japanese 20 Oct 81

[Text] Nippon Electric Corp, Japan's leading semiconductor manufacturer, revealed on the 19th that it will establish the world's largest plant for mass production of VLSI's (very large scale integrated circuits) at its Sagamihara works (in Sagamihara city, Kanagawa Prefecture). This will be a big project involving a total of 27 billion yen in facilities investment by 1983. In addition to producing 64K RAM's (random access memories), the new plant will have a line for full-scale production of the even higher performance 256K RAM, for which no semiconductor manufacturer has yet established mass-production technology. The all-out competition among Japanese, U.S. and European semiconductor companies in VLSI's, the mainstay of the electronics revolution of the 1980's, is about to become even fiercer; NEC's construction of this advanced technology plant will confirm its leap to first place among the world's makers of VLSI's, and will pull Japanese technology for mass production of VLSI's ahead of that of the United States and Europe.

The new plant is planned as a three-story building of steel girder construction with a total floorspace of 19,800 square meters. Construction of the plant building will begin this month. The construction plan covers 2 years, through 1983, with 15 billion yen in facilities investment in the first phase, and 12 billion yen to be invested in the second phase. The intention is to begin partial operation of VLSI lines when the first phase of construction is completed in September 1982.

NEC is enthusiastic about the plant, saying it is the result of the highest levels of technology and will use computers and robots for the highest degree of automation and unmanned operation of production lines. The most distinctive feature of the new plant is that by the latter half of the 1980's it will have production lines capable of mass producing 256K RAM's, the VLSI of the next decade.

The lead-off batter among VLSI's has been the 64K RAM, which made its appearance this year. The circuit line width of this product is 3 microns (1 mm = 1,000 microns). For the 256K RAM, however, a fine circuit pattern with line widths of 1.5 microns is required. NEC will get mass production of 256K RAM's on the right track by gathering the latest technology of drawing circuits on the production line with the electron beam emitted by a device resembling an electron microscope.

When these 256K RAM's are used in computers, miniature desktop computers will have the same capacity for calculation and memory as today's large computers. When used in robots, they will resemble human action more and more closely. Thus the electronification of industry will be further accelerated.

The final details of the scope and content of the production plan are being hurriedly worked out at present, but mass production of the 64K RAM will start when operation begins in September 1982, and production of the 265K RAM will begin in 1983 when construction is completed. The silicon wafers (the semiconductor substrate) which will move along the VLSI lines of the new plant will all be 5 inches (12.7 cm) in diameter. A production volume of 60,000 wafers per month is

planned for 1983; if these are all made into 64K RAM's, it should be quite possible to produce a million chips per month, making this one of the world's largest VLSI plants.

The world market for 64K RAM's is expected to reach $1.8 billion (about 410 billion yen) by 1985. Observing this expansion of demand for VLSI's, NEC gave the green light to construction of this advanced technology plant and entered the competition for facilities investment to expand the semiconductor industry in Japan and the United States.

TI Entry into Japanese Market

Tokyo NIKKAN KOGYO SHIMBUN in Japanese 22 Oct 82

[Text] Japan Texas Instruments (3-6-12 Kita Aoyama, Minatoku, Tokyo; Hideo Yoshizaki, president) has actively entered the gate array (custom IC) field. It is coming into the Japanese market with six bipolar gate array products, including the world's highest level of technology in terms of degree of integration, speed and power consumption. For the present, only the design will be made here; the design will be sent by satellite to TI in Dallas, and production will be carried out in the United States. Within a year, however, the entire process through production will be handled in Japan. Japan TI is scheduled to get into gate array products which are not bipolar at a later date; the three other major products are to be TTL's [transistor-transistor logics], memories and microprocessors.

Japan TI decided to enter the gate array market because gate arrays, the small-scale production of which had not been suited to circuit integration, can now be cheaply and quickly placed on single chips; this has brought a great change to the structure of production, and gate arrays can now be expected to enjoy the highest rate of growth and large markets. Of course, 80 percent of this work is circuit design using computers and depends on the large quantities of software the company has accumulated in handling gate arrays since the 1960's. Japan's gate array market has been monopolized by Fujitsu Ltd, but recently semiconductor manufacturers in the computer field--such as Toshiba Corp, Oki Electric Instury Co and Hitachi Ltd--have decided one after the other to enter this market. Nippon Electric Corp and Mitsubishi Electric Corp, which already have some products ready, have decided to go into foreign sales when the time is right. The entry of TI, which is not surpassed by any domestic manufacturer in experience with TTL's, is a threat to the domestic manufacturers, which inevitably raises the prospect of severe competition before the market has really even opened up.

TI's gate arrays (TAT series) are produced by the "master slice" method using the new Schottky trnasistor logic (STL) developed by IBM in 1972. Because the STL has a simple structure, with an output diode added to a transistor, a high degree of integration and high speeds are possible, and it also lends itself to automatic layout. The speed is close to that of ECL [emitter coupled logic], and power consumption is nearly as low as that of CMOS.

Four of the six products to be introduced are in the TAT series; samples of the TAT004 with 540 gates and the TAT008 with 1,008 gates were shipped recently. Each

has a delay time of 2.5 ns per gate, and a power consumption of 600 microwatts. Two others are now in use in the United States and will soon be announced in Japan: the advanced STL's TAT010 (1,200 gates) and TAT020 (2,420 gates). Both have delay times of 1.0 ns and power consumption of 300 milliwatts; they represent the state of the art in terms of density, speed and power consumption.

Characteristics include: 1) integration of tens to hundreds of MSI [medium scale integration] TTL's on a single chip (TI is now developing a 4,000-gate product, and aims for 10,000 gates ultimately); 2) 2-volt operation of gates within the STL (the I/O interface is 5 volts), which reduces internal power consumption and facilitates selection of packages with a low cost and a high degree of integration; and 3) development of a library of 71 macros (to increase to 100) which automatically give the most appropriate allocation of gates; this reduces the burden on those using the circuits, and makes the manipulator available to the user.

NTT's 20,000 Gate Array

Tokyo NIKKAN KOGYO SHIMBUN in Japanese 29 Oct 91

[Text] On 28 October, Nippon Telegraph and Telephone Corp announced that it had succeeded in developing the world's most advanced "logic VLSI," which packs up to 20,000 logic circuits (gates) on a chip about 1-inch square and features 32-bit operation. This super VLSI is an accomplishment of low power consumption, multiple terminals, and a high degree of integration using CMOS technology with a minimum line width of 2 microns, microprocessing technology and automatic design technology. It has half the line width of previously announced VLSI's, and the improved performance of a 50-percent increase in the degree of integration. Consequently, processors using this logic VLSI as the center of electronic switching or information processing systems will be available by 1983. It is seen as one step toward the realization of NTT's Information Network System (INS).

Very large scale integrated circuits (VLSI) can be classified as memory VLSI's and logic VLSI's; one memory VLSI developed by NTT is a circuit (DRAM) with a memory capacity of 256 kilobits. The present development is a logic circuit which can be used for computation, discrimination, interpretation, or exchange of information. The more logic circuits or gates there are, the more complex or higher level calculations are possible.

This new logic VLSI uses CMOS technology with a minimum line width of 2 microns, thus achieving a degree of integration which packs up to 20,000 gates onto a chip the size of a thumbnail. It uses 32-bit processing, and consumes only 0.75 watts of power. The delay time per gate is 2 ns.

The newly developed logic VLSI will be used in the processors which are the heart of the NTT Electronic Exchange (DEX) and the NTT Information Processing System (DIPS). It can be built efficiently and economically because it can be applied to either DEX or DIPS by just changing the arrangement of a basic circuit (logic cell) which is common to both. But is has the advantage that existing software can be used for the programs for both processors.

NTT has been working on the INS concept which would convert from an analog telephone system to a digital system, and it has decided to build a model system in Musashino-Mitaka District (Tokyo) in FY-82. High-speed processors for DEX and DIPS are indispensable to the INS concept; the development of logic circuits with the world's highest degree of integration will allow the miniaturization and economical production of processors which will bring the INS concept one step closer to reality.

Daiichi Seiko's Fully Automatic Packaging

Tokyo NIKKAN KOGYO SHIMBUN in Japanese 31 Oct 81

[Test] Kyoto--On the 30th, Daiichi Seiko Co (12 Negoro, Momoyamacho, Fushimiku, Kyoto; Akira Konishi, president; TEL 075(611)7155) revealed that it had succeeded in developing the "GP System," a new semiconductor packaging device which cuts down resin loss and greatly shortens the molding cycle. This system is said to completely automate the packaging of semiconductors, a bottleneck in the complete automation of the semiconductor manufacturing process. The company has filed patent applications in Japan and 12 other countries and has begun to accept orders.

This system uses, for the first time, granular thermosetting resins and a runnerless method which eliminates preliminary heat treatment. All processes, from raw material feed to mold cleaning, are completely automated in a single unit. This will allow: 1) the shortening of the molding cycle to 70 seconds from the present 200 seconds, 2) a 60-percent reduction in resin losses, and 3) an 80-percent reduction in operating personnel. It will have a great impact on the semiconductor industry with its intense price competition. Daiichi Seiko has received many inquiries, and has decided to build a new factory in Ogori, Fukuoka, to keep up with orders.

Lead frames with integrated circuits set on them are packaged by protecting them with thermosetting resins or ceramics. In the resin packaging process: 1) the lead frame is set in the mold, 2) the resin materials are fed in, 3) heat and pressure are applied, 4) the product is removed from the mold, and 5) the surface of the mold is cleaned. In the method which has been in use, these steps are separated, so frequent human intervention is necessary, equipment is massive, and mass production is difficult. Daiich Seiko, which is experienced in semiconductor equipment, molding and resin processing, took up these problems 2 years ago and began research and development.

The new system it has succeeded in developing uses granular resin instead of tablets, and injects them directly, without preheating. Then four lead frames (variable) are potte[illegible]s a unit and shaped in a transfer press using a runnerless method. (The liquefaction and hardening of the resin is done efficiently in the mold by means of a temperature control system in the press and the mold.)

And in regard to automation, the introduction and alignment of lead frames, the measurement and introduction of resin materials, the formation and removal of the package and the cleaning of the mold are performed one after the other, and such

things as positioning are also checked automatically. The equipment is compact, measuring 2,500 mm deep, 2,300 mm long and 2,500 mm high.

The quality of the product itself will be improved through this series of accomplishments. Because the bottleneck of temperature controls on the viscosity and hardening of the resin has been eliminated and additives have become unnecessary, it is possible to use resins which do not require aftercuring. President Konishi says this means "there is now a way to use resin packaging instead of ceramics," and the company has joined the raw material producers and begun research on this matter.

Daiichi Seiko estimates that a company producing 2.5 million semiconductors per month with 24-hour operation for 22 days (85 percent capacity utilization) could cut resin costs by 250,000 yen per month (with resins at 1,200 yen per kg), and also improve workers' productivity fivefold (three units could be run by one operator instead of five) and cut power costs by 27,400 yen per month. The price of the new system is about 40 million yen for the standard model. The area of the land for the new factory being built in Ogori, Fukuoka, is 27,400 square meters and that of the building is 5,000 square meters. Operation is scheduled to begin in December.

NEC's Expansion of 64K RAM Production

Tokyo NIKKEI SANGYO SHIMBUN in Japaneses 4 Nov 81

[Text] Nippon Electric Corp, the largest manufacturer of semiconductors, has expanded and improved its system for producing 64K RAM VLSI's, and is preparing to triple its present production to the 1 million unit per month level by March 1982. That is because the European and U.S. LSI users to which NEC has shipped samples have been sending notification that the NEC product meets their inspection standards for 64K RAM purchases. Hitachi Ltd and Fujitsu Ltd already plan on monthly production levels of 700,000 and 1 million units by March; a VLSI battle centering on these three companies is beginning.

According to NEC, some 130 U.S. and European LSI users have given notice that its 64K RAM meets their quality standards. Vice President Atsuyoshi Ouchi has said that "seven of the 11 major U.S. and European computer manufacturers are included" in that number. It appears that NEC has already begun to supply some of the 130 companies. The quality notifications will not all result in orders, but they do incidate that users are planning to adopt 64K RAM's soon.

On that basic, NEC has directed Kyushu NEC (in Kumamoto), which is the focus of its production of 64K RAM's, to increase production. At the end of October it was set up for a monthly production of 300,000, but NEC plans to jump to the 1 million level by expanding output 150,000 per month; 600,00 at the end of December and 1.05 million per month by March 1982. Then production plans will be adjusted in accordance with market trends.

NEC had not expected this response from the users until 1982 and had taken the cautious stance of holding monthly production of 64K RAM's to 300,000. In fact, the market price of 64K RAM's (on the spot market) in the last year has dropped from about 20,000 yen to under 2,000 yen; that has stimulated the users' desire to purchase and has hastened market formation.

The move by NEC was preceded by production increases by Hitachi and Fujitsu. Hitachi increased its monthly production from 500,000 in September to 700,000 in October, and will go up to 1 million by March 1982. Fujitsu plans on 700,000 per month by March. Toshiba Corp, Mitsubishi Electric Corp and Oki Electric Industry Co each plan to produce 300,000 per month as of March 1982.

Over 20 Japanese, U.S. and European companies produce 64K RAM's now, but the offensives by NEC, Hitachi and Fujitsu will put the Japanese forces in the forefront of the VLSI war.

(Commentary) NEC and Hitachi, Japan's leading semiconductor makers, have both decided to produce a million 64K RAM's per month. This shows that the VLSI era has begun in earnest, and it has shown the Japanese and others that Japanese companies are well ahead of the American manufacturers of "Silicon Valley."

The 23 March 1981 issue of Fortune, the influential American magazine, was a special issue on "Silicon Chips--the Japanese Challenge." The cover illustration which shows a silicon wafer ring on which a sumo giant is throwing a wrestler with stars on his tights, sums up developments with the 64K RAM, which has become the battlefield for the Japanese-U.S. warfare of the 1980's. NEC and Hitachi have fired up their engines to increase monthly production to 1 million RAM's each, and Fujitsu will not be far behind them; this does not cheer up the U.S. companies.

According to local reports, Intel is having problems with performance and will suspend production of 64K RAM's at least until December, and shipments of Mostek, which has been the leading producer in the memory market, have fallen far behind schedule because of changes in circuit design. The world's largest manufacturer of semiconductors, Texas Instruments (TI), is making use of the high quality control technology of Japanese technicians, and has decided to have Japan TI produce a million chips per month at its Miho plant in Ibaraki Prefecture; Japan TI recently said that would be impossible under present circumstances, and seems to have fallen behind the production plan.

Apprehension regarding the strength of the Japanese is increasing daily in "Silicon Valley." That can be seen in a recently released report by DataQuest Co, which specializes in market surveys for the U.S. electronics industry. The report says that 1.78 million 64K RAM's were shipped in the second quarter of 1981, and that the two largest market shares were held by Japanese companies: Hitachi shipped 700,000, Fujitsu shipped 360,000, and Motorola shipped 350,000.

The "Japanese-U.S. Semiconductor War" began when Japanese manufacturers seized a 40-percent share of the U.S. market for 16 K RAM's, the generation before the 64K RAM. It is clear that "Silicon Valley" will be stirred up by the strength of the Japanese forces as the struggle for the 64K RAM market begins. It should be noted that it is because of concern about rekindling the Japanese-U.S. semiconductor

war that NEC, a leader in the industry, has worked out the policy stated by Vice President Ouchi "To start production of 64K RAM's in the United States as quickly as possible."

NEC, Hitachi 64K, RAM Production

Tokyo NIHON KEIZAI SHIMBUN in Japanese 5 Nov 81

[Text] Nippon Electric Corp and Hitachi Ltd, the two top manufacturers of semiconductors, have firmed up plans to begin producing 64K RAM VLSI's, their most advanced semiconductors, in the United States in mid-1982. The 64K RAM is a strategic commodity in the competition among the semiconductor manufacturers of Japan, the United States and Europe, and the large manufacturers of Japan have taken the lead by beginning mass production. Accordingly, the Japanese companies have a large share of the U.S. market, and it is their judgment that renewed Japanese-U.S. trade friction in the field of semiconductors would be inevitable without local production in the United States.

The 64K RAM is used in the memory which is the heart of a computer, and is an LSI with four times the memory capacity of the 16K RAM which is in wide use at present. The LSI users of the world have been actively adopting the 64K RAM recently, and the market is expected to expand rapidly in 1982.

In view of such a market trend, NEC and Hitachi both decided to increase 64K RAM production to 1 million per month by March 1982, double or triple their September 1981 levels of 300,000 and 500,000. Local production in the United States was put on the schedule at the same time.

NEC's local production in the United States will center on the manufacture of 16K RAM's by NEC Electronics USA (San Mateo, California). The plan is to begin assembly of 16 K RAM's there in April 1982, and examination of the specifics has begun. This spring NEC will begin construction of a second Electronics USA plant, to be completed in 1985. This plant is to carry out the complete VLSI production cycle, including the preliminary process of building the circuit, but NEC will go ahead with assembly without waiting for the plant to become operational.

Hitachi, on the other hand, will have Hitachi Seminconductor America (Dallas, Texas), its U.S. plant, assemble 64K RAM's as well as the 16K RAM's it has been assembling. Hitachi plans to expand this plant in 1982. Under the plan the production of 64K RAM's was to begin in the second half of 1982, but it is said that this has been moved up to the first half of 1982.

Like NEC and Hitachi, Fujitsu Ltd manufactures 64K RAM's and plans to increase output to 700,000 per month by March 1982. These three companies are the world leaders in the mass production of VLSI's. Accordingly, Fujitsu is also expected to move quickly to use its U.S. plant for local production.

Shortage of 32K EPROM's

Tokyo DENPA SHIMBUN in Japanese 6 Nov 81

[Text] The seminconductor market is experiencing a shortage of Erasable Programmable Read-Only Memories (2732), and those involved have had to make allowances. The increased production of video games is seen as the primary cause of the shortage. A shortage of the low-power Schottky (LS) TTL's used in microcomputers peripheral circuits is also becoming evident.

The EPROM shortage is receiving much attention within the industry: a microcomputer manufacturer remarked: "The suppliers were talking about a 2732 shortage around the end of September and the beginning of October," while a components dealer reported: "There has been a striking shortage of EPROM's the last 2 or 3 weeks, and allowances have had to be made."

When the comments of those involved are put together, the following combination of factors can be seen: 1) there was a resurgence of video games such as the space invader game that was so popular in 1979, and large numbers of game machines were exported; 2) Japanese semiconductor manufacturers concluded export contracts with U.S. game manufacturers such as Atari, and lacked adequate supplies for the domestic market; and 3) the price of 32K EPROM's temporarily dropped to about 1,000 yen, and semiconductor manufacturers planned to switch to 64K chips next spring.

Premium prices were paid for 8K EPROM's (2708) during the severe shortage of early 1979. This time, too, there are increasingly numerous examples of 2732 purchases at somewhat higher prices. And last time there was also a shortage of LS TTL devices for microcomputers; industrial users are apprehensive about a parts shortage.

The issue is whether this shortage will be temporary or relatively protracted; both views are found among those involved. Many believe that production of game machines will peak at the end of the year, but others say that even so the shortage will continue half a year as it did last time, and that a serious impact on computer production cannot be avoided.

In any case, this shortage is not as severe as the memory shortage during the last boom, and since it has been expected to a certain extent since September, it probably will not spread to other fields. This spring a shortage of CMOS standard logic IC's, which resulted from increased production of digital pachinko games, caused problems in the market, and there are those who think EPROM's will show a trend similar to that of pachinko games.

From the perspectives of the semiconductor industry, market conditions for Japanese memories have been noticeably sluggish this year; there has been almost no growth. There are therefore some who find the EPROM shortage an encouraging sign of the sort they have not seen lately.

Hitachi's Small Outline Package

Tokyo NIKKAN KOGYO SHIMBUN in Japanese 13 Nov 81

[Text] On the 12th, Hitachi Ltd (Katsushige Mita, president) announced development of a 24 pin 16K CMOS static RAM in a miniature plastic package which can be used for high-density mounting, and said that it is prepared for mass production of 10 items which will go on sale on the 21st. This miniature package is called a "small outline package" (SOP); compared with the standard 24 pin plastic package for a 16K static RAM (2K word by 8 bit organization), its area is about 40 percent, its thickness (resin portion) is about 50 percent, and the lead pitch (distance between pins) has been shortened by half (to 1.27 mm).

The static RAM differs from the dynamic RAM in that it does not require complex external devices such as a refresh circuit, address multicircuits or other control circuits, or external timing clocks. It is thus most appropirate for small-scale equipment such as that used in microcomputers. But the mounting density of the static RAM has been low, since the number of pins and the size of the package increase with the memory capacity: a 16 pin DIP 7.62 mm wide for 4K, a 20 pin DIP 7.62 mm wide for 16K (16K words by 1 bit) and a 24 pin DIP for 16K (2K words by 8 bits).

It is for that reason that the static RAM was developed in a miniature package appropriate to handy sized memory packages such as pocket computers which require dense mounting. Hitachi's ordinary MOS memories have all been packaged in DIP's with a lead pitch of 2.54 mm; this SOP is the first to differ. At present it is used only for the SRAM, but it is expected that its use will expand to other projects and that it will eventually be registered with JEDEC [Joint Electron Device Engineering Council] or EIA [Electronic Industries Association] and standardized.

Production of 50,000 per month is expected by the end of 1981. At present the price is 2,400 yen (in lots of at least 1,000), 20 percent higher than the standard package; with a battery backup capability it will be 3,000 yen.

More on SOP

Tokyo DENPA SHIMBUN in Japanese 13 Nov 81

[Text] Hitachi Ltd announced on the 12th that it has developed and will begin to sell a 16K static RAM in a miniature plastic package capable of high density mounting. This package has about half the area and thickness of the standard package, so Hitachi says it is suited to equipment such as pocket computers, NC, and POS terminals which require high density mounting. The sample price is 2,400 yen (in lots of 1,000), or 3,000 yen with battery backup capability.

The miniature package has a lead pitch which is half the standard (shortened to 1.27 mm); the resin portion is 50 percent the standard thickness. High density mounting is possible because the package is not inserted but is soldered into the

printed circuit board, and pin allocation is limited to two directions as in the case of the DIP.

The package will be used for 10 different items with access times of 120 ns, 150 ns and 200 ns. It will be interchangeable with Toshiba products.

Nippon Gakki's VHSIC With SIT

Tokyo NIKKAN KOGYO SHIMBUN in Japanese 20 Nov 81

[Text] Nippon Gakki Co (Genichi Kawakami, president) revealed on the 19th that it has succeeded in developing and will begin mass production of a high-speed LSI using an SIT (static induction transistor) as the logic circuit. The SIT is a semiconductor which has been praised internationally as "the third transistor"; Japanese and U.S. electronics manufacturers have been rushing to put it to practical use, but Nippon Gakki is the first to succeed. The scientific details are to be announced in the Electronic Device Study Group of the Electronics and Telecommunications Society, which is to meet at the Electrical and Communications Institute of Tohoku University in Sendai on the 20th. Nippon Gakki wants to upgrade its products by incorporating this LSI in the next generation of electronic musical instruments, digital audio equipment, video discs and home computers.

The operation of the SIT differs from that of the more common bipolar and FET (field effect transistor) types; its major characteristics are high integration and high speed with a low PD product (product of delay time and power consumption) as a switching element. The theory was announced by Prof Junichi Nishizawa of Tohoku University in 1950, and a prototype was completed in 1971. This is an achievement of Japanese technology and has been noted as the "third transistor," which surpasses earlier types. Development on the element level was paralleled by progress in high integration, and there was a great sensation when an IIL (integrated injunction logic) SIT logic circuit was proposed in 1975 and a prototype completed in 1976. The Science and Technology Agency has undertaken expansion of the possibilities of the SIT as a creative scientific development project, and the research of Professor Nishizawa has been continued.

Now Nippon Gakki has gone ahead of the world's most influential manufacturers and become the first to succeed in large-scale integration of the SIT for use in a household device, while powerful domestic and foreign firms and research institutions such as Mitsubishi Electric Corp, Hitachi Ltd, General Electric (GE), Bell Laboratories, Stanford University and IBM are still in the research and development stages. The U.S. Government has also undertaken SIT development as a major theme of its big VHSIC (very high speed integrated circuit) project.

This element has about 4,800 gates on a single chip. It includes RAM, ROM, a counter, an adder, latches, registers, random gates, and about 300 other peripheral circuit elements.

The process involves design of a pattern with a minimum line width of 3 microns; it draws the relatively low current of about 60 microamps per gate, for an

operating power consumption of about 600 milliwatts. There is diffusion dispersion among elements. The chip size is 5.65 mm by 6.25 mm (35.31 square mm), and two layers of metal wiring are used. The supply voltage is 5 volts, and it can be interfaced with a TTL. A 40 pin dual inline package is used.

As for the functions of this LSI, it can be used as a graphic display generator for home computers; it can generate a vector given only the initial and final positions; and it can generate memory addresses and data corresponding to picture elements on the screen.

Picking with a light pen is also possible, and one can enter ROM and select from 16 types of lines, including short dashes or alternating points and dashes. It is also possible to draw at high speeds using two memories. And it is possible to connect up with a standard 8 bit CPU. Patent applications have been made on about 50 points.

Nippon Gakki plans to develop a VLSI of the Schottky type (SSITL) which is about 10 times faster, for a broad range of applications, including the next generation of electronic musical instruments, digital audio equipment, video discs and home computers.

Remarks Tohoku University Professor Nishizawa: "This accomplishment is a first. There is nothing anywhere that operates as fast. I am very happy that it (the theory) has been proved."

The SIT resembles the FET structurally, but differs in that the positive output characteristics are those of a triode and the negative feedback phenomenon (whereby after a certain level the flow deteriorates as current increases, and only the voltage goes up) is absent. Its speed surpasses that of bipolar transistors by a factor of 10. Other superior characteristics are that high power applications of 100 watts or more are possible and power consumption is low. Tohoku University Professor Nishizawa started the concept in 1950, and a prototype was built in 1970. It is said to be the only semiconductor discovery of which Japan can brag to the world. But it requires a perfect crystal substrate, and the manufacturing technology is difficult; it has not previously been much used in commercial integrated circuit products.

Mitsubishi-Westinghouse Joint Venture

Tokyo NIKKAN KOGYO SHIMBUN in Japanese 21 Nov 81

[Text] Informed sources revealed on the 20th the Mitsubishi Electric Corp (Nihachiro Katayama, president) had reached almost complete agreement with the large U.S. integrated electric machinery manufacturer Westinghouse Electric Corp (Robert E. Kirby, president) to establish a joint venture for the production of VLSI's in the United States.

The announcement that Chairman of the Board Sadakazu Shindo of Mitsubishi and Westinghouse President Kirby have reached final agreement is expected soon. This will be the first Japanese-U.S. joint venture established to produce semiconductors.

The agreement covers four points: 1) A joint venture company for the production of VLSI's is to be formed by this spring. 2) The two companies will make equal investments. 3) The plant will be located in either Sunnyvale, Boston, Houston, Dallas or Atlanta, in consideration of the water quality, the quality of labor and so on. Plant operation is to begin the spring of 1983. 4) 64K dynamic RAM's will be produced at first, with 256K DRAM's to follow.

The joint venture concept started with a strong request from Westinghouse, and negotiations started 18 months ago. A working-level committee has ironed out the details, and a final decision by company heads is pending now.

The confirmation that Mitsubishi and Westinghouse will form a joint venture for semiconductors will be well received by the Minister of International Trade and Industry for its effect in easing semiconductor trade friction between Japan and the United States.

Fujitsu's High-Speed CMOS

Tokyo NIKKAN KOGYO SHIMBUN in Japanese 27 Nov 81

[Text] Fujitsu Ltd (Takamasa Yamamoto, president) has developed and begun selling new high-speed (4 ns per gate) CMOS gate arrays: the MB60000H series with 2,000 gates and the MB61000H series with 3,900 gates. At the same time, Fujitsu has expanded its family of standard logic cells by about 20 and upgraded the user's logic design capability and ability to use internal gates.

Fujitsu is the leading manufacturer of gate arrays. Until now its CMOS gate arrays have consisted of four sizes (770, 1,275, 2,000 and 3,900 gates) all using the technology of silicon gates with two layers of metal wiring. Because the speed of these is like that of low-power Schottky TTL's--a 7 ns per gate delay time--and the power consumption during operation is only in the tens of milliwatts, much progress had been made in large-scale integration of logic circuits using standard TTL and CMOS logic. Recently, however, there have been demands for faster LSI's to improve the performance of devices. Therefore, Fujitsu has developed high-speed CMOS gate arrays and begun manufacturing the first two products, which have 2,000 and 3,900 gates.

The high-speed CMOS gate arrays have these characteristics: 1) The switching speed is 4 ns, a 40-50 percent improvement over earlier CMOS gate arrays (MB60K and MB61K) and much faster than standard TTL's and LS-TTL's. 2) The flip-flop toggle frequency, which is one criterion indicating speed, is above 20 MHz (compared with 14 MHz for earlier arrays) under the worst conditions. The increase in speed has been achieved by shortening the transistor gate length to 2.8 microns from the old 3.6 microns, and by improving the production process, including mass production.

The development and design methods, chip composition, package, conditions of use and so on are the same as for earlier CMOS products. Orders will be accepted beginning in January; development time is 14 weeks.

Fujitsu expanded its standard logic cell family concurrently with development of this high-speed CMOS gate array. The standard logic cells have logic functions corresponding to TTL and CMOS standard logic; with them the user can design LSI's and draft schematics. There had been 16 types; now about 20 more--mostly with the same functions as medium scale integrated circuits (MSI's)--have been added. These will make logic design easier; they will increase the usability of internal gates and upgrade the performance of the devices themselves. The additional cells can be applied to either the new high-speed CMOS gate arrays or earlier CMOS gate arrays.

Toshiba's Expanded U.S. Production

Tokyo NIKKEI SANGYO SHIMBUN in Japanese 30 Nov 81

[Text] Toshiba Corp has decided to greatly increase its production of semiconductors in plants located in the United States. The scale of production will be raised from 1.5 million units per month now to 2 million per month in the spring of 1982. The reasons for this decision are that preparations for local sales have gone forward in the year and a half since Toshiba went into the United States and new users are wanted, and that there is a desire to keep the smoldering semiconductor trade friction between Japan and the United States from flaring up again. Toshiba put its first plant in the United States in April of 1980. Toshiba purchased an existing semiconductor plant (Malman Integrated Circuits) owned by Bansei Industries, a major manufacturer of lighters, and established Toshiba Semiconductors (over $2.66 million capital). Because it was an existing plant, production of IC's (integrated circuits) could begin immediately, and each month the plant produces 1 million masked ROM's, which are commonly used in peripheral terminals and television games, and 500,000 16K static RAM's for microcomputers.

The major "car electronics" component has been 4K and 16K RAM chips for Ford, which is the second largest automobile maker in the United States. Most of the silicon wafers for these chips are shipped from Japan, but the masked ROM's are produced entirely in the United States.

Demand for semiconductors in the United States has been sluggish because of the high interest rates there, but the recent sharp drop in interest rates suggests demand will recover early in 1982. Toshiba apparently decided to expand its production facilities to keep up with that recovery. And although little growth can be anticipated in the number of new cars produced, progress in "car electronics" is expected as demands for improved performance increase. That factor made it necessary to increase production of static RAM's.

This production increase will not require construction of new facilities, since about 5 billion yen has already been invested in construction of a new plant. But Toshiba plans to introduce advanced equipment for the inspection process in order to increase production of high-quality IC's.

TI's Expanded Production in Japan

Tokyo NIKKEI SANGYO SHIMBUN in Japanese 1 Dec 81

[Text] One by one the major U.S. semiconductor manufacturers have been increasing Japanese production and sales of CMOS logic semiconductors, which have low power consumption and a broad range of applications. First Japan TI, a Japanese corporate entity of America's Texas Industries, the world's largest producer of semiconductors, became the first member of the international TI group to produce CMOS logics; now Motorola Semiconductors Japan, the Japanese corporate entity of America's Motorola Corp, will begin importing and selling high-speed CMOS logics developed by the parent company in the United States. Both are aiming for expanded sales to Japan's electrical, precision and machinery industries. This penetration of the Japanese market for consumer goods should be noted as an open declaration of the intentions of U.S. semiconductor manufacturers.

The major semiconductor manufacturers of the United States have fixed their sights on Japan and decided to increase production and sales of CMOS logics because: 1) the recession in the United States means that all items are selling slowly in their own semiconductor market, and 2) strong growth in the field of consumer goods is expected in the Japanese market. They can be said to be closing in on the Japanese manufacturers of IC's of the MOS type.

First Japan TI decided to produce CMOS logics using both its plant in Hatogaya, Saitama (completed in 1968) and its plant in Hiji, Oita (completed in 1973). Samples of 35 items were sent out this year, and plans have been made to expand the product line to about 100 items in the first half of 1982.

It has been decided that within the international TI group, the responsibility for production of CMOS logics will be given to Japan TI, which is to provide supplies to the United States and Europe. It is thought that once production in Japan is going well, it will be possible to compete with Japanese companies in the overseas market.

Motorola Semiconductors Japan recently decided to begin sales in Japan of the very high speed CMOS logics (MC175HC series) developed jointly by its U.S. parent and National Semiconductor, and it has begun full-scale imports. With the items it had been handling, Motorola Semiconductors Japan plans on a product line of about 200 items; comprehensive marketing activity will develop soon.

The CMOS logic is a semiconductor with a broad range of applications, including television sets, calculators, and various control devices. Having the advantage of low power consumption, it is experiencing rapid growth in consumer products in Japan. It is estimated that in 1981 CMOS and other MOS logics accounted for about 40 percent of all IC production in Japan. This is well ahead of the 20 percent of bipolar linear IC's and of MOS memories.

In the U.S. market, on the other hand, the emphasis is on data, military, and industrial applications, so high-speed processing takes priority over low power consumption, and the most numerous mass-production items are bipolar IC's rather than the MOS type. It is for that reason that Japanese companies like Toshiba and Hitachi have taken the lead over U.S. companies in CMOS technology.

American's two leading semiconductor manufacturers have taken the offensive in CMOS, which has been Japan's big weapon; competition in technological development and sales is likely to become all the more fierce for Japanese manufacturers which have taken this attack.

Toshiba's Exports of 64K SRAM

Tokyo NIKKAN KOGYO SHIMBUN in Japanese 2 Dec 81

[Text] Toshiba Corp (Shoichi Saba, president) announced on the 1st that it has developed 64K static RAM's (TC5564P and TC5565P) using CMOS and VLSI technology, and will ship samples in March 1982. These 64K SRAMs are complete VLSI's with about 400,000 elements integrated on a single chip and rival the 256K dynamic RAM. This is the first mass-production application of the technology which Matsushita Electric Industrial Co announced to the International Fixed Circuit Association in February 1980.

Random access memories, which can be freely read or written onto, come in dynamic and static varieties. The static RAM needs three or four times as many elements as a dynamic RAM with the same memory capacity, but it has the advantages of not needing a refresh circuit, connecting easily to other LSI's, and consuming less power through CMOS technology. Accordingly, there is expected to be great demand for static RAM's for microcomputers and office automation (OA instrumentation.

Toshiba has scorned to follow the IC companies that are rushing to increase production of 64K dynamic memories, and has put its emphasis on the field of the static RAM; it is a leading manufacturer which now boasts a 40 percent share of the world's 4K CMOSRAM's (CRAM) and a 90 percent share for 16K CRAM's.

The TC5564P is a 64K CRAM with all CMOS circuitry; it is a step up from the 16K CRAM's (TC5516 and TC5517) now being sold. Its access time is twice as fast (100 ns) as the 16K CRAM, and its power consumption is a very low, 2 nanoamps on standby.

The TC5565 is SRAM which uses NMOS construction for the storage circuits and has low power consumption (2 microamps on standby); it is a step up from Toshiba's 16K SRAM (TMM2016P). Its access time is 100 ns.

Using reduction-projection exposure technology and dry etching for a 2-micron line width, and such VLSI technology as two-layer wiring on polycrystalline silicon, Toshiba has integrated over 400,000 elements on a chip about 6 mm square. In order to raise the yield and thus reduce the cost, Toshiba has for the first time adopted "redundancy circuits" to salvage bad elements. In addition, it has developed its own circuit technology to facilitate interconnection with associated VLSI's without synchronization, as well as circuit technology to reduce power consumption.

The characteristics include: 1) an 8K word by 8 bit organization which facilitates interconnection with microcomputers, and also a pin allocation which is compatible

with that of the standard 64K EPROM, 2) nonvolatile memory which, in the case of the TC5564P, can be maintained 5 to 10 years using commercially available lithium dry cells, and 3) low power consumption of 2 milliamps in operation, which is suited to OA equipment which should be small and have self-contained power sources. A standard 28 pin dual inline package is used.

The sample price is 60,000 yen for the TC5564P and 50,000 yen for the TC5565P. The level of production will be decided after watching the trend of demand for the 16K SRAM, but it should be from 30,000 to 40,000 per month in the second half of 1982; full-scale production will begin at the end of 1983 or in 1984.

Oki's Expanded Production of 64K RAM

Tokyo NIKKEI SANGYO SHIMBUN in Japanese 3 Dec 81

[Text] Production of IC's by Miyazaki Oki Denki Co (200 million yen capital), the center of Oki Electric Instury Company's semiconductor production, has recently reached the million per month level. The largest item within this total is the 64K RAM, the most prominent VLSI, with a monthly production of 200,000. By the end of this August Oki had shipped about 100,000 64K RAM's, including samples, to major users in Japan and other countries; test results and purchase inquiries have been coming in from these users. For this reason, Oki has decided to increase its production of 64K RAM's to 300,000 per month by the beginning of 1982, in order to respond to growing demand.

To strengthen its semiconductor sector, Oki established the wholly-owned Miyazaki Oki Denki to produce IC's; it began operation in April 1981. The plan was to increase production volume by gradually shifting products from Hachioji, Tokyo, which had been Oki's big plant, but so far the major effort has been 16K SRAM's and the masked ROM's which are much used in peripheral terminals; it was only in November that the 64K RAM came to lead production.

Within the semiconductor industry, Nippon Electric Corp and Hitachi Ltd, have decided to raise production of 64K RAM's to the million per month level by the end of March 1982, and companies like Fujitsu Ltd and Mitsubishi Electric Corp have also rushed to increase production. Because its VLSI plant was delayed, Oki has without question gotten a late start in the 64K RAM field, but it may be able to catch up to a great extent by reaching its goal of 300,000 per month at the beginning of 1982. Its effort also speaks of the rapid recent increase in demand for VLSI's in the domestic and foreign markets.

Oki plans to increase the scale or production at Miyazaki Oki Denki to 3 million per month during FY-82. The production plan for 64K RAM's has not been decided yet, but at that pace they are expected to make up a considerable part of the total production. Thanks to the new plant, 1981 sales volume in Oki's electronic component sector, focusing on semiconductors, is expected to increase to 32.6 billion yen, up 28 percent from the previous year.

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SCIENCE AND TECHNOLOGY

SENSOR DEVELOPMENT FOR ROBOT'S, TV REPORTED

Kawasaki Torque Sensor

Tokyo NIKKAN KOGYO SHIMBUN in Japanese 13 Jan 82 p 11

[Text] Kawasaki Heavy Industries (president Kanehiro Hasegawa) with the cooperative effort of Kyowa Electric Industry (3-5-1 Chofugaoka, Chofu-shi, Tokyo-to, president Masayasu Kawai, Telephone 0424 (88) 1111) has succeeded in the development of a torque sensor which can detect instantaneously the forces involved at the various operational shafts of a robot. This unit is plugged into each shaft so that it does not subtract any strength from the robot capabilities and functions with the very high precision of 0.01 kilogram-meter and makes possible automated adjustment for optimum operation for all shafts of the robot even under high speed operating conditions. This development not only greatly improves the durability of a robot but has also opened the way to automated teaching which is expected to become a theme of the future, and it is expected to contribute greatly to robot reliability.

Great Improvement in Durability

The three elements of speed, positioning precision, and durability carry large weight where robots are concerned. But because robot operation depends on visual judgement, the optimum operation suffers should the instaneous speed be too fast and possibly cause damage to the part concerned or the cycle time may be fouled should the instantaneous speed to be too slow, and the automatic adjustment for optimum notion to bring out the robot's capabilities to a full 100 percent level has been a formidable problem.

It was considered at this company that though the instantaneous detection of the dynamic torque operating on each shaft accompanied by the proper processing of this information would make possible automated adjustment, and work was initiated 2 years ago on the development of a torque sensor, and this effort was rewarded at the end of last year by the world's first practical sensor.

The use of a strain gage is appropriate for detection of force, but there is a need to make the detection section somewhat weaker in order to improve precision, and this has been a problem where application to robots is concerned in which strength is an overriding consideration. This is why the practice has been to install special detection mechanism on the hands and wrists of a robot and not on the entire system. On the other hand, such a detection system is

only good for detection of small forces such as those involved in assembly operations, and it is not suited for detection of large dynamic forces such as those involved in spot welding operations.

The torque sensor developed by this company is a rod-shaped affair along the lines of a strain gage with a fairly small central section for the purpose of increasing sensitivity, and its strong point is that it is embedded into the robot shaft so that it does not lower robot strength. Japanese patents have been applied for, and patent applications will soon be made in the western countries with the one in the United States being made through the Unimation Company.

This sensor is to be installed at various rotational parts of each shaft of a robot and will automatically control operations of the various shafts operating in diverse directions to the optimum operating levels, and it has precision fine enough to detect even the very fine vibrations inherent to the robot itself. When installed on Unimate 2000, a precision of 0.1 kilogram-meter was realized while an installation on an Electromotive Puma enabled detection of 0.01 kilogram-meter. When installed on present day robot operating at maximum speed (4 meters/second), the precision did not suffer.

This development has newly provided the robot with its own self diagnostic capability and has not only improved durability and wearability but has also contributed to improved energy conservation. Since it can be installed on robots presently in operation, it is expected to be used for the time being for automated adjustment to enable optimum operation of these robots, and future plans involve development of automated teaching and applications to various operational phases of force control.

Electronic Industry Association's Project

Tokyo NIKKEI SANGYO SHIMBUN in Japanese 25 Jan 82 p 4

[Text] The Japan Electronic Industry Association (president Jinhachiro Katayama, president of Mitsubishi Electric Corp.) will initiate a survey research project on sensor (sensitive detector) technology to develop new applications of computers. In the project engineers in the related fields will be invited from the different makers belonging to this association to form a special committee. The committee will examine both domestic and foreign research and development results for several years as well as to study the problem areas of technological development and the trends in needs. At the same time, the "machine translation system survey committee," "home work system survey committee," and "local network system survey committee" which were started last year will continue their activities.

A sensor is a device which detects a physical or chemical phenomenon and converts it to numerical data which a computer can handle. This is an indispensible device for broadening the utilization area of computers, and the development of superior sensor technology is an urgent social need for the home computer days when the general household will use computers.

In particular, OA (office automation) and FA (factory automation) are progressing with remarkable tempo. Thus, there is need for early development of sensors of even finer detection capabilities. The Electronic Industry Association has concluded that an industrial level survey research is the best approach to respond to these needs of the industrial society.

As for the machine translation system project which started last year, it has dispatched foreign survey groups to study the situation at EC (European joint study group), the United States, and Canada. According to these surveys, EC has already succeeded in partial development of the necessary machinery, and it uses the equipment and the efforts of the roughly 3,000 translation specialists working there to turn out translations of the official documents and preceedings of the conference by the next day at the very latest which are circulated to the member countries in their own language.

The Electronic Industry Association plans to utilize the results of these surveys and is presently searching for a method to develop a Japanese translation system. For the present, emphasis will be placed on translating Japanese to English. Should translation of Japanese to English become a reality, then the English can be readily translated into French, German, and other countries using the results of the western researchers. Parallel research with development of semiconductor elements is planned, and it is hoped that concrete results will be obtained in about 3 years.

The homework system project is intended to exploit work done at home and here again the situation in the west is being studied while a system adaptable to the Japanese industrial society will be developed. The Electronic Industry Association plans to develp this these advanced application technologies in order to respond to the general expectations relative to the technological advances of the computer as manifested by the OA which presently is seeing such great success in Japan.

Sanyo's Color Sensor

Tokyo NIKKAN KOGYO SHIMBUN in Japanese 27 Jan 82 p 13

[Text] Sanyo Electric (president Kaoru Iue) announced on the 26th that it had succeeded in the application of amorphous (noncrystalline) semiconductors as light sensors and thereby developed a new sensor area. The sensors developed to a practical stage include the three types of 1) an integrated full color sensor which can discriminate 12 colors, 2) single color sensor which detects the primary red, blue, and green colors, and 3) a full spectrum brightness sensor which covers the full visible spectrum and costs just half the price of single crystal sensors used in the past. It had been considered in the past that amorphous sensors were inferior in performance compared to single crystal sensors, but this company put together amorphous thin film (1 micron) integration technology, PiN continuous separation forming method, and direct lead frame coupling (ADL structure) to establish a mass production technology to commercialize a product which can outdo single crystal sensors. The price of

the sensor based on this company's production scale will be 250 yen per unit for the integrated type full color sensor (to be shipped from March) at a monthly production rate of 50,000 units, the single color sensor (end of February) will be 150 yen per unit with monthly production of 100,000 units, and the brightness sensor (15 February) will be 100 yen per unit with monthly production of 100,000 units. This company is planning not only the sale of individual units but also is planning to hasten application to facsimile.

The optical sensors in the past have been limited to single crystal silicon sensors. But, these sensors involve long wavelenghts, and they require infrared cutoff filters (imported mainly from West Germany) to enable human eye scanning. This filter is expensive, and any great reduction in cost was difficult because of complicated production processes of sealing resin and lead wire.

These difficulties were resolved in a single stroke by the amorphous technology. This new sensor is formed by placing a transparent and electrically conducting film on a glass base plate, forming amorphous silicon with PiN junctions, and slicing it into chips by electrode current. Not only is production much simpler than with single crystals but it has become possible to form integrated red, blue, and green colors. In addition, a face down bonding method was developed in which solderable lead frames are first formed upon which the chips are placed followed by hot pressing (100°C). With this approach, sensitivity, dark current, and gamma value equivalent to those association with single crystal units have been attained, and the cost has been reduced to about a half.

The term amorphous indicates an irregular composition structure without ordered crystal structure, however, it exploits certain properties not seen in single crystals or polycrystals under a given set of conditions. In addition, the use of thin film of the order of 1 micron minimizes the amount of raw material required and the manufacturing process is simple. This company has already developed a practical amorphous solar battery, and its output this fiscal year will be the highest in Japan (500 kW for the year). This new light sensor represents its second milestone. It is said that this light sensor should find very wide applications in the areas of robot intelligence and office automation (OA).

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SCIENCE AND TECHNOLOGY

GREEN CROSS BIOENGINEERING ACTIVITIES DESCRIBED

Tokyo SHUKAN BIRION in Japanese 11 Dec 81 pp 72-75

[Article by Noritoshi Tsukada]

[Text] "I did everything I could think of. Now, I have finally cooled down enough to be able to stop and look around." The commander in chief of Green Cross Corporation's research and development, Chairman Ryoich Naito, lately appears to have finally regained his composure.

Gene Recombination Initial Stage Completed in Past Year

It happened at the Green Cross board meeting held in November last year. Naito, who usually fired harsh questions at others, cast off his assertiveness completely and apologized for his inability on his knees. The apology was for seemingly having endangered the pioneer status in the development of interferon (IFN) derived from conventional sources such as leukocytes and cultured lymphoblasts, when it was revealed at that time that genetic engineering had progressed rapidly in Europe and America. With the momentum of this board meeting, Green Cross has moved swiftly into bioengineering, including genetic engineering.

In February, Green Cross gave a contract to an American bioengineering research specialty company, CRI (Collaborative Research Incorporated), for research on yeast dissociants which produce T (gamma)-interferon (IFN-T) by gene recombination. In the same month, the corporation also tied up with an American bioengineering research specialty company, Genecs, for mass production technology (separation and stabilization of bacillus coli variants) of human serum albumin, a variety of plasma proteins which are indispensable for the human body.

In August, Green Cross made the decision to send a capital subscription to CRI, and for the first time in Japan acquired the right to use the basic patent held by America's Stanford University for gene recombination. In September, it signed a contract to import B-type hepatitis vaccine manufacture technology by gene recombination of bacillus coli with a Swiss bioengineering research specialty company, Biogen. These examples show the series of technology import decisions to which Green Cross has committed itself.

These actions resulted from the concept that the "Japanese technological level is still low" (Chairman Naito), but they are also the fruit of the labor by 75-year-old Naito, who regardless of his old age and bloodshot eyes searched through

overseas literature before and after the New Year and visited Europe and America more often than he had in the past. On the other hand, Green Cross embarked on the development of IFN-β with CRI and IFN-α by itself by means of gene recombination. In addition, a test facility for the culture renal cell method thrombolytic agent, Urokinase, which had been imported from CRI before the above actions were taken, has begun to operate. Indeed, he "did everything he could think of" in the year since he began taking action.

Green Cross has expertise in blood-related fields and its specialty is polymer drugs. "We have continuously been devoted to the study of biotechnology, which hardly drew any attention in the past" (Chairman Naito). It was because it was Green Cross' specialty field that the corporation went ahead of others into IFN production from leukocytes and cultured lymphoblasts.

However, as a result of the unexpectedly rapid development of gene recombination technology, there was growing apprehension that Green Cross would be left behind in the mass production technology which would be essential to determine the wide range of diseases for which IFN is applicable. IFN derived from leukocytes and cultured lymphoblasts suffers from a raw materials bottleneck. Green Cross started to tackle gene recombination methods on a full scale, staking its prestage as a pioneer of IFN.

Raw materials are a serious problem for the corporation in other areas besides IFN. The major products are all made from raw materials such as proteins and enzymes which are dependent on natural organic substances, for instance, plasma, at the top of the line, human urine, saccarine agents, vegetable oils and colloidal agents. Especially the main products, such as Albumin and Urokinase, which use plasma and human urine as raw materials, are likely to be subject to difficulty in procurement. As one of the measures to solve this problem, bioengineering is surfacing. Furthermore, the bioengineering manufacturing processes are very advantageous in cost, so much so that Green Cross is promoting a serious involvement in bioengineering for the maintenance of a stable foundation.

Although it is exposed to furious developmental competition, bioengineering is the most advanced field of science loaded with multiple problems to be resolved. Even citing the example of IFN development by gene recombination, it is still at a stage where "a top runner may or may not appear in sight in a few years" (Chairman Naito). However, a lengthy period and astronomical expenses are customarily associated with the development of a leading new drug. Naito's relaxed countenance has much to do with the confidence that he has completed the first stage of strategic positioning. He is bold enough to say bluntly: "There is no meaning to my existence unless we come out as the top contender."

Sales of Artificial Blood and Delay in Clarifying Anticarcinogenicity of IFN

IFN is a glycoprotein that works to block the proliferation of viruses which have infiltrated into a living body. It is said to be widely effective for viral diseases. It is also reported to inhibit the splitting of normal cells and tumorous cells. At present, three varieties, α, β and γ, have been discovered based upon the difference in antigenicity and molecular weight, and the γ type is considered superior in focal anticarcinogenicity.

Commenting on the acquisition of yeast dissociants that produce IFN-γ, the development of which is contracted to CRI, the development of full-scale production is awaited since "the production capacity is still insufficient although all yeast dissociants are delivered as soon as they are produced" (Chairman Naito). It will also take another year to be able to produce a satisfactory α type by gene recombination, despite the promotion of the production of this variety of interferon within Green Cross.

To fill the gap until then, β type derived from fibroblasts are being purchased from CRI and γ type derived from leukocytes are being purchased from American Key. α type made from leukocytes and cultured lymphoblasts within the corporation are used in clinical tests. However, as for β type, some judge it "not too hopeful" (Chairman Naito).

Naito explained Green Cross' policy: "We avoided the roundabout path of trying to pursue the big target, a cancer control agent, from the beginning, but aimed at defining familiar diseases for which the drug is applicable one after another in order to gain the status of a pioneer." Last May, the corporation applied to manufacture IFN for treatment of virus keratoconjunctivitis, and subsequently it is expected to apply for permission to include herpetic ulcers of the cornea and herpes zoster as applicable diseases. Afterward, Green Cross intends to expand the applicable range further to virus hepatitis and influenza and to challenge "the inner citadel," anticarcinogenicity. Mass production is the prerequisite for starting clarification of anticarcinogenicity. The mass production will begin about the time that yeast dissociants are made available.

Since it requires relatively more time to define applicable diseases in the largely marketable treatment field, effective new drugs are gradually being lined up to make a debut in other fields. The first entrant is Fluozol DA, for oxygen transfusion (artificial blood).

In the middle of November, this drug was passed by the investigating committee of the Central Pharmaceutical Council, and it looks like permission for manufacture will be granted by next spring, although there still remain examinations by a special sectional meeting and a regular sectional meeting. The drug is expected to be sold starting next fall after the price of the drug is listed. This will soon bear fruits resulting from the time spent on research since 1969 and the investment of nearly 2 billion yen.

In contrast to blood for transfusion that lasts only 2 weeks, Fluozol DA can be stored, does not require a specific blood type, and will not cause hepatic side effects. The market for blood for transfusions is as large as 17 billion yen annually, but the blood is chronically in short supply. Since Fluozol DA is usable for emergency blood transfusions and treatment of carbon monoxide poisoning, it is possible that it will serve as the replacement for a considerable portion of artificial blood. It is said that "it provides some good effects not obtainable from blood transfusions in the treatment of partial heart failure and failure of the flow of blood to the brain, and in the surgical process" (Naito).

Disadvantages that require further research for improvement are that Fluozol must be frozen for preservation and that it must be used jointly with an oxygen inhaler.

As to the new drugs that will appear next, B type hepatitis vaccine in the final clinical stage and a cancer control agent, Spadicomycine, are the leading candidates. B type hepatitis vaccine produced by the gene recombination method will be sold at the earliest in 5 years. Therefore, it will be manufactured as a product first by using HB_sA_g blood as the raw material. Since at present there is no effective treatment method for the B type hepatic virus, which causes chronic hepatitis, hepatic induration and hepatic cancer, this new drug is being watched with gerat expectation. On the other hand, Spadicomycine draws attention as an agent that blocks DNA synthesis. It is likely that the technology will be offered to the American Bristol-Myers company.

Green Cross has enjoyed high growth mainly in blood-related formulations by means of an outstanding development efficiency such as to "achieve results in 6 out of 10 developmental themes if given a serious effort" (Chairman Naito).

The business results for this December period are expected to show a small gain after all. The favorable growth of Venoglobulin, an improved drug for serious infection which was put on the market in January; Albumin, a drug to supply proteins; and Plasmanate will absorb the slump in Urokinase, a drug to dissolve thrombi, due to a reduction in the price that slashed income by 10 percent and the increase in research and development expenses.

Just as the previous low growth period of 1980 was saved from becoming a permanent state by the introduction of Venoglobulin, this time, a strong contender called Fluozol DA will make its debut. Green Cross has a reputation in its operations for being quick at seizing an opportunity, as seen in its swift change of direction to bioengineering and its daring conversion of manufacturing processes. However, it is certainly an absolute must for Green Cross to come out as the top runner in IFN by the gene recombination method if it is to be able to restore high profit growth.

Interview With President Hachiro Ishigaki

[Question] I hear that the business results of this December period renewed the record for profit increase since the stock was put on the market in 1957.

[Answer] At the time of the interim balance statement, we concluded that the estimate of a small decrease in profit was still correct since the effect of the drug price cut was ambiguous. However, judging from the trend in October and November, the business did better than was projected. Sales will come to slightly less than 70 billion yen, and the net profit is sure to exceed 4.5 billion yen. We are hoping to bring the net profit up to at least 4.6 billion yen (4.53 billion yen in previous accounting term).

[Question] You mean, even with that profit, the growth in profit is still less than in the former high growth period?

[Answer] We encountered a turning point due to the expected reduction in income from Urokinase with the drug price cut and the increase in research expenses in conjunction with the full-scale development of the most advanced technologies. However, we regard this as a transitional phase. It is likely that permission for manufacture of artificial blood will be granted by next spring. Also, in 3 years,

Urokinase from cell culture will be brought into the spotlight. With the contributions from B type hepatitis vaccine, liposteroid and interferon in addition to the successful Venoglobulin, we can predict that in 3 years our organization will grow to be one of the big five of the industry.

New Developments After Swift Move Toward Bioengineering

	Product name General name	Medical use	Tie up partners	Present state Developmental stage
BIOCHEMICAL	Urokinase	Clearing of blood clots	Singly by Green Cross	Monthly business 800 mil yen
	Plasmanate	Supplying of proteins	American Cutter	Monthly business 500 mil yen
	Albumin	Supplying of proteins	American Cutter	Monthly business 1.1 bil yen
	Venoglobulin I (including Veno-globulin)	Treatment of grave infection	Singly by Green Cross	Monthly business 1.7 bil yen
	Intralipos	Supplying of calories	Swedish Vitrm [phonetic]	After manufacture singly by Green Cross, sold for the first time in Sep 81
	Spadicomycin	Anticancer effect	Singly by Green Cross	Clinical interim stage
VIROLOGY AMYNOLOGY	High immunity globulins	Anti B-type hepatitis, Antistreptococcus pneumonia, antibacillus pyocyaneus	American Alfa	Anti B-type hepatitis was imported and sold.
	α-interferon (from leukocytes)	Virus keratoconjuctivitis, herpetic diseases, etc.	Singly by Green Cross	Applied for treatment of keratoconjunctivitis
	α-bulin	Liver transplant rejection inhibition	Singly by Green Cross	Applied
	B-type hepatitis vaccine	Hepatitis	French professor Maupas [phonetic]	Clinical last stage
CELL CULTURE	α-interferon (from lymphoblasts)	Virus diseases, etc	Singly by Green Cross	Speeding the confirmation of drug efficacy
	β-interferon (from fibroblasts)	Virus diseases, etc	American CRI	Imported and clinically tested
	Urokinase	Clearing of blood clots (90% cost reduction)	American CRI	Clinical initial stage

CELL BLENDING	Antitetanic serum	Tetanus	Tohoku University	Clinical early stage
	Anti-interferon antibody		American Hybritech	Clinical early stage
GENE RECOMBINATION	γ-interferon	Virus diseases, etc	American CRI	Developing bacteria that produce IFN
	β-interferon	Virus diseases, etc	American CRI	"
	α-interferon	Virus diseases, etc	Singly by Green Cross	"
	Albumin	Supplying of proteins	American Genecs	"
	B-type hepatic vaccine	Hepatitis	Swiss Genecs	"
SYNTHESIS AND OTHERS	Fluozol DA	Oxygen transfusion	Singly by Green Cross	Permission for manufacture will be granted
	Veropirin	Relief of pain	Singly by Green Cross	Applied
	Liposteroid	Anti-inflamation	Singly by Green Cross	Clinical late stage

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SCIENCE AND TECHNOLOGY

COMPETITION AMONG NUCLEAR MANUFACTURERS INTENSIFIES

Tokyo NIKKEI SANGYO SHIMBUN in Japanese 21, 22, 23 Oct 81

[21 Oct 81 p 5]

[Interview with Director Mastaka Nishi, Hitachi Limited]

[Text] Japan's nuclear power plant industry with the three companies Mitsubishi Heavy Industries, Toshiba Corporation, and Hitachi Limited as a nucleus is on the threshold of a powerful revolution. Mitsubishi has been involved with the pressurized light water reactor (PWR) and Toshiba-Hitachi with the boiling water reactor (BWR) ever since the establishment of the Japanese nuclear reactor market. This has been a sort of established "order." However, it has been disclosed that Toshiba and Hitachi may also go into PWR in cooperation with the West German KWU Company. Thereby, the long maintained "order" seems to be crumbling. Meanwhile, power companies which have used either BWR or PWR up to now have started to think about adapting different reactor types. A new reactor development war has begun with these three companies divided into two camps. We went to the heads of these three companies which are presently on the verge of engaging in a nuclear reactor sale dogfight to hear their strategies.

Question: What is your aim in getting on with the KWU Company's feasibility study?

Answer: The number of nuclear power plants is increasing, and in order to avoid a situation in which all reactors of a certain type which have had an accident be stopped, it is only natural that we look at a diverse array of them. There is increasing awareness on the part of power companies to study this problem more closely. This is why we have decided to survey the users' feelings on whether we should introduce the KWU reactors into this country. This company presently is engaged in construction of BWR alone, but if we can also include the PWR and be able to provide both types, it will be very advantageous for our business.

Question: Do you have any specific plans for introducing the KWU reactor?

Answer: The present situation is that a thorough feasibility study should be conducted. What is to be done then has not yet been decided. This company will soon send a technology team to West Germany, and a special group will be created here to back up that team's efforts in research and development. We expect the

survey to last about a year. We will decide only after we have conducted this survey. Even after we decide on the introduction and purchase of the reactor, time has to be allotted for the acquisition of technology and government inspections so that the actual introduction will be sometime in the future.

Question: Let me ask what your basic policy is for promoting nuclear power generation plants, both domestically and abroad?

Answer: We have entered several bids for secondary systems (turbines, generators) in international competition and have been successful with some of them. On the other hand, export, including the primary system (nuclear reactor section), requires nuclear fuel supply as well in most cases, which this makes primary system expert difficult. We feel that we already have the capability to supply reactors as long as fuel is not included. This company has the capacity to fill two orders per year, but we are still not at the stage where we can get enough orders to display our full capability.

At the present time, we can only point to our delivery record with customers such as Tokyo Electric Power which are BWR customers, but we have also maintained our efforts to cater to power companies using PWR such as Kansai Electric. This policy will remain unchanged. I feel that the ABWR on which joint development has started will appeal to PWR users.

Recent Events

15 July. Signing of joint agreement by Toshiba, Hitachi, GE (General Electric) of the United States, and Tokyo Electric on the development of an advanced type of boiling reactor (ABWR)

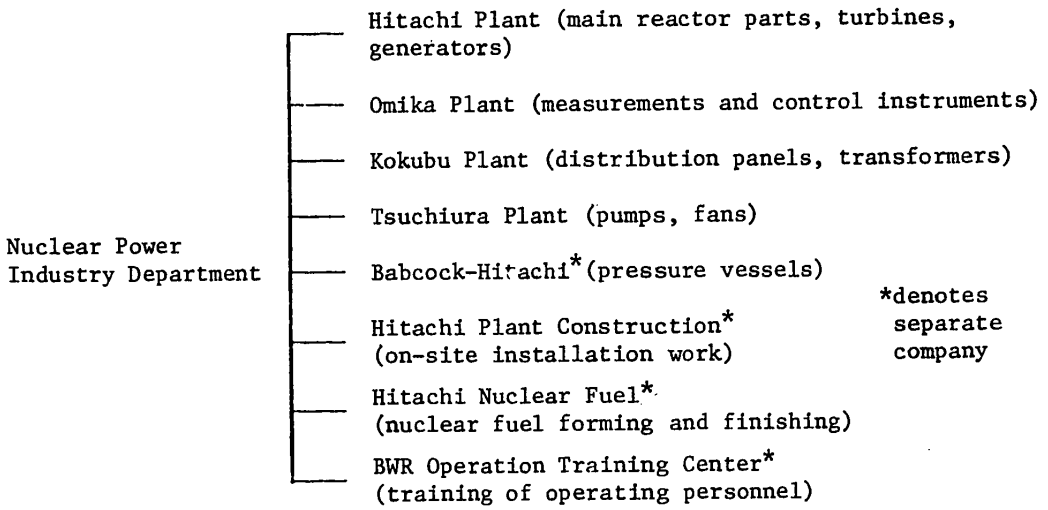
1 September. Mitsubishi Heavy Industries and WH (Westinghouse) of the United States sign agreement for the joint development of a new-type pressurized water reactor (APWR)

5 October. Toshiba, Hitachi, Fuji Electric and the West German KWU Company sign agreement on feasibility studies (industrialization) of KWU's pressurized water reactor (PWR)

Confidence in Fierce Pursuit

It is said that Hitachi was much more aggressive than Toshiba in reaching this agreement with KWU. Both companies are competing with each other since they both are BWR makers, but the actual situation is that Toshiba has been taking a leading role. Following the introduction of Japan's first BWR by Toshiba from GE, the second order was through Toshiba, and even the third was by the same route. The first reactor Hitachi handled was the reactor for the Shimane Power Plant of Chugoku Electric Power, and eventually it also received an order from Tokyo Electric Power for the Fukushima No 4 power plant. But with the advent of the newer and larger capacity plants, the company once more took a back seat to Toshiba. Toshiba also took orders from Chubu Electric Power.

Nuclear Power Organization of Hitachi Limited



It has been Hitachi's desire to reverse this turn of events, and this line of thought may be deduced from what the company said, "It is still up in the air whether we will introduce the KWU reactor." It also took the stance, "We must select the sharpest minds to send to West Germany."

This company's pursuit of Toshiba is also reflected in its activities in obtaining orders. The company has two operating plants (for which it undertook construction of the reactor section) which is considerably less than the six plants (including two which were joint orders with GE) accounted for by Toshiba, but the two companies are running neck and neck when reactors presently under construction and on order are considered.

As an expression of the confidence this company has in nuclear power, the former Nuclear Power Technology Headquarters was elevated to the status of Nuclear Power Industry Department and began to operate independently in August of last year. The intraplant system was reinforced in this manner, while an agreement was reached with the world's foremost engineering company, the Bechtel Company, to reinforce overall strength.

The company says, "We can construct an entire nuclear plant with in-house and associated companies' capabilities. Our quality control extends that far, and we emphasize reliability, which is the most important theme in nuclear power generation." Once agreement is reached among power companies to use the KWU reactor, this company will no longer play second fiddle to Toshiba as in the past. Hitachi, which has the poorest record among the three companies, is now starting a furious pursuit.

[22 Oct 81 p 5]

[Interview with Director Yoichi Aoi, Toshiba Incorporated]

[Text] Toshiba Corporation is not only involved in the development of an advanced boiling water reactor (ABWR), but is also initiating studies on the introduction of the West German pressurized water nuclear reactor (PWR) and moving toward the role as an integrated maker.

Question: What are the future prospects for the ABWR on which joint development has already started?

Answer: ABWR will further enhance the safety and reliability aspects of the present boiling water reactors (BWR) and is aiming for a "Japanese-type light water reactor" that will conform with this country's environment. This effort has already started, and, if things proceed in orderly manner, we should be ready to enter commercialization just about 1985. This ABWR, unlike nuclear reactors of the past which mainly consisted of imported technology, is to largely incorporated technology which was independently developed by this company. This alone is motive enough to succeed in this development, and we have the resolve to see this thing through.

Question: How do you compare this ABWR with PWR on which you have just made an agreement with KWU of West Germany?

Answer: Our company's involvement in these two reactor types is different in nature. We intend to apply technology accumulated to date to improve the BWR and come up with a better reactor, ABWR. Preceding the signing of the recent joint development agreement, this company, Hitachi, and General Electric of the United States and other leading BWR makers of the world had organized a "technology renovating team" and started development of ABWR. In contract to this, the KWU reactor is only now going into the preliminary survey stage. The decision on its introduction will be made after the feasibility studies (commercialization survey).

On the other hand, the KWU reactor is already in operation, unlike the ABWR for which there is no working model as yet. Despite this, there is need to introduce earthquake-resistant design and provisions to conform to Japanese standards before the reactor can actually be placed in the hands of Japanese power companies, and considerable time probably will be required for this. Should everything go according to plan with these two types, I feel that the ABWR will be on line first. We have been looking at the PWR of KWU for some time, but only recently have there been expressions on the part of the power companies to earnestly study its introduction. We felt that the time was ripe.

Question: With the new addition of ABWR and the KWU reactor to your arsenal, how do you think the nuclear reactor sales competition will develop?

Answer: We are studying the KWU's PWR because we feel that it is good that the makers should study various types of reactors. But we have not made the

decision as to importation. Should the introduction of this KWR reactor become a reality, we will be able to respond to user needs for both BWR and PWR in the area of light water reactors, which are presently the main stream of nuclear power generation. Thus, we feel that trade talks both at home and abroad will be conducted more advantageously than at present. I feel that the primary thing from here on is to put all effort into the export of nuclear plants, including the reactor. It is unfortunate that nuclear power construction throughout the world is in a slowdown stage presently.

Events at Toshiba, Hitachi

June 1966. Technology agreement reached with GE (General Electric) of the United States and BWR introduced.

April 1967. Nippon Nuclear Fuel for nuclear fuel forming and finishing is founded by joint subscription with GE.

March 1971. BWR Training Center established.

September 1981. Agreement to renegotiate technology agreement contract with GE.

Nuclear Power Organization of Toshiba Corporation

Nuclear Power Industry Headquarters
- Tsurumi Plant (intrareactor construction, control rods, generator)
- Nishi Turbine Plant (turbines)
- Fuchi Plant (control panel, electrical parts)
- Toshiba Plant Construction* (on-site installation work)
- Ishikawajima-Harima Heavy Industries (pressure vessel, containment vessel)
- Nippon Nuclear Fuel* (fuel forming and finishing)
- BWR Operation Training Center* (training of operating personnel

* indicates separate company

ABWR, an Effective Weapon

For Toshiba, which is a top maker of BWR, to enter into an agreement with the West German KWU Company is a chance to leap into position as one of the world's influential nuclear reactor makers with both BWR and PWR capabilities.

There is a 2:1 preponderance of PWR over BWR in the world nuclear market today, but the situation in Japan is for BWR to outnumber PWR 11 to 10. Although it has opened a considerable gap between itself and Hitachi where BWR is concerned, all the PWR users rely on Mitsubishi Heavy Industries, so Hitachi has no way of leading in Japan where nuclear power production is concerned the way things stand now.

In this situation, the development of ABWR project got underway before Mitsubishi's new type reactor (APWR) and moves were made toward PWR by the agreement with KWU. There is a move afoot to use a number of different reactor types among the power companies, and the ABWR is expected to prove an effective weapon to use on PWR users of the past.

The further addition of the KWU will certainly strengthen this company's nuclear power system. It will be particularly advantageous in the area of plant export because of the preponderance of countries using PWR. It may be said that the top position occupied by Mitsubishi Heavy Industries is well within range.

On the other hand, this company has some unpleasant aspects as well. Hitachi Limited, which was a partner in the signing of the technology agreement with GE and in the agreement with the West German KWU Company, is fast closing in from the rear. In another direction, Mitsubishi is expected to make a strong bid for present BWR users.

This company is proud that it has long engaged in the development of leading technology in the electrical industry, and it has records to support this claim. Judged from this, how will the ABWR and the KWU BWR fare? It won't be too long before we will get the answer.

[24 Oct 81 p 5]

[Interview with Director Kotaro Iida, Mitsubishi Heavy Industries, Ltd]

[Text] Toshiba and Hitachi are now attempting to make inroads into the area of pressurized water reactors (PWR) which heretofore has been the sole domain of Mitsubishi Heavy Industries. To counter this, Mitsubishi Heavy Industries plans to guard its top position through the development of an advanced type reactor (APWR).

Question: How do you plan to counter the entry of Toshiba and Hitachi into PWR?

Answer: The fact that we have from the start introduced technology and developed experience is the prime reason this company alone is presently handling PWR. On the other hand, there seems to be some resentment by some people that any one company have a sole monopoly, and we understand that this situation cannot be maintained over a very long period. We anticipated that this day would come. We, who have for a long time specialized in this type of reactor, feel that the only way to do business is to offer the user a better product. Ever since we started developing PWR technology, we have

been more interested in making nuclear power production an established system for our country than in seeking direct profits, and all our efforts have been directed in this direction. The PWR is now used by many companies, and we feel that our efforts have finally borne fruit.

Question: Have you any plans to invade the area of boiling water reactors (BWR) which Toshiba and Hitachi presently are active?

Answer: We don't feel such a move is necessary. We have faith that the PWR is superior to the BWR both in safety and reliability. This is evident when one views the world situation and finds that the trend in most countries is to PWR's.

Question: What are your plans to develop advanced reactors and your future strategy?

Answer: We are trying to develop the APWR in cooperation with the Westinghouse (WH Corp.) of the United States and are presently in the final survey stage of how to divide assignments. We will start making final detailed plans beginning next month, and we are asking PWR users, such as Kwansai Electric Power to cooperate. This includes capital subscription. We are targeting a PWR with even greater reliability, safety, and economy than the present models. Where development is concerned, we want to be the nucleus to come up with a reactor which is suitable to Japan's environment. Where Japan's energy situation is concerned, we must construct more new nuclear power plants. We feel that the APWR will not only appeal to the present PWR users but also to users who presently are operating BWR's.

Mitsubishi Activities

April 1959. Mitsubishi Nuclear Power Industry (funded by three Mitsubishi groups with Mitsubishi Heavy Industries as nucleus) and the WH (Westinghouse) Corp. of the United States enter into technological agreement and the PWR is introduced.

December 1971. Mitsubishi Heavy Industries and WH in technological agreement. Mitsubishi Nuclear Fuels established.

June 1972. Nuclear Power Generation Training Center established.

September 1981 Mitsubishi Heavy Industries and WH agree to renegotiate technological agreement.

Tension in the Face of a Harsh Environment

The company said, "We were resigned to its eventuality," but ever since the agreement between Toshiba, Hitachi and the West German KWU was announced, there has been no question that there has been tension at Mitsubishi Heavy Industries. There have been some comments within the company that "We may have to initiate research on the KWU reactor."

Nuclear Power Organization of Mitsubishi Heavy Industries
(* Indicates Separate Company)

Prime Mover Engine Industry Headquarters

- Mitsubishi Nuclear Power Industry* (design of nuclear power steam generators)
- Kobe Shipyards (nuclear power steam generator production)
- Taksago Seisakuxho (turbines)
- Mitsubishi Electric* (generator, electrical equipment)
- Mitsubishi Nuclear Fuel* (fuel assembly production)
- Nuclear Power Development Training Center* (operational training)
- Nuclear Power Service Engineering* (engineering services)

Mitsubishi Heavy Industries has compiled a top record among the nuclear reactor makers in Japan, and it single-handedly controls the PWR market. However, there has been criticism that "the company has enjoyed a monopoly so long that it sits cross-legged and has delayed developing new technology," and that it has actually been somewhat behind Toshiba and Hitachi in new reactor development. The fact that it is subjected to such criticism itself is indicative of the great influence the company has on the domestic market.

Toshiba and Hitachi are now attempting to invade the domestic PWR market which has been Mitsubishi's domain all along. There is an increasing desire on the part of power companies to switch from a "one company, one type reactor" to a multitype reactor concept, and the power industry which heretofore had been divided into the P and B camp is losing this identity as the BWR makers push sales to PWR users.

At the same time, inroads that Mitsubishi may make among the BWR users have been blunted by the intentions of Tokyo Electric Power which is considered the "leader" to introduce the KWU reactor rather than Mitsubishi's PWR. The situation which surrounds Mitsubishi Heavy Industries is beginning to be severe and completely different from what it has been these last 10 years.

According to informed people in Japan's nuclear power program, it is difficult to rate PWR's and BWR's by definite grades. To counter this, Mitsubishi Heavy Industries says, "We have no interest in BWR," which it attributes to the smaller worker exposure and lower production of radioactive wastes of PWR. With regard to the Toshiba and Hitachi move, it said, "BWR by itself imposed certain limits, and there was no choice but to go into PWR as well."

Mitsubishi also stated with regard to APWR that "with improvements to the present reactor, we can provide the user with an adequately satisfactory reactor, and that it should also be possible to counter the advanced type boiling water reactor (ABWR). We have to be wary that if we sit still, the situation might be erroneously interpreted to mean that we have no desire to improve. This is why we have decided to come up with a much better product than in the past" and indicated our desire to attack the BWR market.

In the face of expected attacks on its sacred ground by Toshiba and Hitachi with the double weapons of BWR and PWR, Mitsubishi is in the quandry not only about defending its territory but also about developing its own counterattack.

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SCIENCE AND TECHNOLOGY

BRIEFS

SEMICONDUCTORS EXPORT--Japan's electronics industry said Wednesday it would not reduce production of semiconductors or restrict exports to the U.S. where it has been criticized for penetrating the market. The Japan Electronic Industries Association said Japan had about 70 percent of the present U.S. market for the 64K Ram, the latest computer memory device. But it said Japan could not maintain this position "as the U.S. industry is certain to become more competitive." It said Japan's surplus in the trading of integrated circuits narrowed to 700 million yen (about $3 million) last year compared to 2.8 billion yen ($12 million) in 1980. An association spokesman said Japan and the U.S. had also agreed to lower tariffs on integrated circuits last year. [Text] [OW270951 Tokyo ASAHI EVENING NEWS in English 26 Feb 82 p 4]

SUPERCOMPUTER PLAN--Officials of Hitachi, Ltd., have disclosed that their firm recently embarked on a development project for a supercomputer capable of handling complicated computations in science and technology areas at a superspeed. Hitachi plans to complete the first set as early as next year if all goes well, they said. According to the plan, the machine's speed will be more than twice that of Cray-1, built by Cray Research Co., a U.S. firm and now regarded as the world's fastest computer, and more than 20 times that of the general-purpose computer. At present, MITI is pressing ahead with a large-scale project for a supercomputer; Hitachi, with several other domestic firms, is involved in this project, too. In addition, Fujitsu Ltd., is developing its own supercomputer separately. Hitachi appears to be a step ahead of them all, however. According to Hitachi, the demand for the supercomputer, especially useful in complicated analyses of fluid and molecular structures, is expected to increase rapidly. Hitachi already received inquiries from a few potential users. The firm is planning, not only for domestic sales, but for exports as well. The MITI project, recently started with the cooperation of six domestic makers, is for the development of a supercomputer with a speed 1,000 times that of the general-purpose computer. What Hitachi is trying to do is to develop a more practical type more quickly. Nevertheless, since the planned Hitachi-type is of higher speed than those planned by Cray Research and other U.S. makers, it is expected to give further impetus to competition between Japan and the United States. [Excerpts] [OW060839 Tokyo NIHON KEIZAI SHIMBUN in Japanese 4 Mar 82 Morning Edition p 7]

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